

# **MANUFACTURING STRATEGY AND BUSINESS STRATEGY IN INDIAN FIRMS**

**A Thesis Submitted  
In Partial Fulfilment of the Requirements  
for the Degree of  
MASTER OF TECHNOLOGY**

**by  
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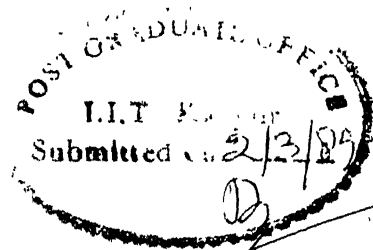
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## CERTIFICATE

This is to certify that present work on "Manufacturing Strategy and Business Strategy in Indian Firms" by Mr Ghanasham Kulkarni has been carried out under my supervision and has not been submitted elsewhere for award of a degree.

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### ABSTRACT

Strategic planning for business, and in particular for manufacturing is becoming timely and pertinent as our industrial economy gathers speed under the liberalized and internationally oriented regime. Fast changing global technology trends marked by increasing use of information technology and flexible manufacturing have forced market trends towards shorter product life cycles and more customized products. This charged atmosphere of change has brought the issues of management of technology and management of manufacturing to the fore front of top managers' priorities. Moreover success in international trade is mainly governed by quality and cost, thus making "Manufacturing Strategies" even more appropriate for many Indian firms that have international aspirations.

The study evaluates viable strategic patterns followed by Indian manufacturing industries. For this purpose a questionnaire was designed and a survey of manufacturing industries was conducted. Based on analysis of data received from 17 business units, conclusions are derived.



The conclusions regarding an empirical framework for aspects of Business Strategy, Competitive Strategy and Manufacturing Strategy are derived. Comparative studies on these strategies along with performance studies across different strategic aspects are conducted. And finally a proposition has been made towards generalizing and building a model of Business Units in India.

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# CONTENTS

<u>Chapter #</u>		<u>Page</u>
1	Introduction	1
	Industrial Environment in India	2
	What is Manufacturing Strategy?	3
	Structural decisions in Manufacturing Strategy	5
	Competence and consistency	7
2	Literature and Overview on Manufacturing Strategy	9
	The concepts in Manufacturing Strategy	10
	Concrete decision areas in Manufacturing Strategy	18
	The process of building manufacturing competence	28
	Successful implementation of Manufacturing Strategy	28
	Empirical studies in Manufacturing Strategy	30
3	Pursuit and Plan of the Study	32
	Overview	32
	Questionnaire design	34
	Variables and their measurement	37
	Data acquisition	40
4	Results and Analysis	42
	Sample and respondent profile	42
	Consistent aspects of Business Strategies	44
	Consistent aspects of Competitive Strategies	48
	Consistent aspects of Manufacturing Strategy	52
	Different types of business units	56
	Relationship of performance with the company clusters	59
	Linkages between different strategies	60
	Nature of strategic preferences in the Sample	64
5	Discussion and Conclusion	68

## 1. INTRODUCTION

This study is about strategic planning for manufacturing in Indian Industries. No attempts have so far been made to understand the strategic aspects of Indian Manufacturing. In this exploratory work a sketch of strategic thinking in Indian Manufacturing Industries is experimented. Strategic process research in the area of Manufacturing is relatively new and lacks the benefit of accumulation of empirical findings. This study is an attempt in this direction. The empirical analysis presented here draws some conclusions regarding the nature of Manufacturing Strategies in Indian Industries.

The recent interest in Manufacturing Strategies, in east and west alike, is probably a result of a number of complementary developments. On one hand, the ever increasing competition on the international front has forced the business to evolve and look into strategic choices in their manufacturing functions. They have thus started thinking strategically about their manufacturing. As the risks associated with strategic errors are large, the managers are forced to make careful and elaborate analysis. On the other hand there is much evidence of technological advances. The progressive firms or the firms that are under competitive attack are adopting the techniques such as CAD, CAM, CAE (Computer Aided Design, Manufacturing, Engineering) and CIM (Computer Integrated Manufacturing). A charged atmosphere of change and improvement in manufacturing is being created by the use of computers, thus bringing in the issues like

Management of Technology and Management of Manufacturing. Along side, a major movement is being seen in the Business and Management Schools. Ever since the pioneering publication of Skinner in Harvard Business Review (1969), more and more academicians and institutions are recognizing the need for a curriculum in production operations management with strategy orientation. Finally a growing number of researchers are picking up on the pioneering works of Skinner, Hayes and Wheelwright, to study the Manufacturing Strategies.

## INDUSTRIAL ENVIRONMENT IN INDIA

Presently we observe some visible signs of change in the world trends in technology, economics, markets etc.

The global trends in technology is marked by the increasing use of information, automation and flexible manufacturing. This has forced the market trends towards shorter product life cycles and more customized products. The ground rules for competition are shifting from cost to flexibility, quality and faster delivery.

It is worthwhile to recapitulate some trends in the industrial environment in India in order to appreciate the growing importance of manufacturing strategies.

Historically the industrialization in India has been mainly achieved through a policy of self reliance and import substitution. In the initial years after independence the industry in India was very young hence it had to be protected from international competition through import regulation.

The resources were limited hence industrial licensing was necessary.

1950's were marked with adverse trade balance which worsened in sixties. This was followed by the policy of import substitution. The seventies were dominated by regulatory controls such as MRTPA, FERA and price controls. During early eighties first attempts towards deregulation were made. The policies now in force are towards opening the Indian economy for international market and delicensing of the industries. The domestic market also has started to exert some competitive pressures.

Under such changing trends, from a predominantly regulatory regime to a growth oriented mode, the industry which has adjusted to providing goods services to a protected and shortage-prone domestic market, being subjected to international competition would speak volumes about the need for proper strategies for the business. Moreover, success in international trade is primarily dictated by quality and cost thus making "manufacturing strategies" even more important for many firms that have international aspirations.

## WHAT IS MANUFACTURING STRATEGY ?

Manufacturing Strategy can be viewed as a functional level strategy along with other functional level strategies such as financial strategy, marketing strategy, R&D strategy (Hofer, 1975, Hofer and Schendel, 1978). This suggests a three level hierarchy of strategies for a Multi-business company. The corporate strategy refers to two specific

things, first, defining the corporate missions such as the business in which they will participate and second, procurement and distribution of financial resources among the different business units. The Business strategy refers to the distinctive competence that each strategic Business Unit (SBU) is trying to achieve over its competitors. At the core of business strategy are firm's decisions about the product/market choices. Third in the hierarchy are the functional strategies of the SBU, for example Manufacturing Strategy. Though this hierarchy establishes the goals and means relationships among various levels of strategies, it does not mean that the relative importance of strategies at a lower level is less (as might be perceived). For instance the manufacturing function in any manufacturing industry takes maximum share of the resources and attention and hence, it should have a more comprehensive manufacturing strategy, or a market oriented firm is expected to have an exclusively built marketing strategy.

From the discussion above we can see that the business goals put a certain requirement on the firm's manufacturing function. For instance if the SBU's competitive strategy is to achieve the shortest delivery time in the industry then the manufacturing facilities, systems and the set up has to be exclusively designed to achieve this particular end. If quality is crucial for a business to survive against the competition then the manufacturing has to be designed to produce the highest quality products. A manufacturing set up just like any machine, can be designed to do certain things the best and not all. So there exist a set of trade-offs

(Skinner W. 1969). Manufacturing can either achieve the shortest delivery time or a minimum inventory level and usually not both. As we generalize we come to the four basic components of such trade-offs. They are cost, quality, delivery time and flexibility. These are the four means of achieving the market competence, and they can be directly reflected in terms of the manufacturing requirements (Wheelwright S C 1984). So the manufacturing strategy is not achieving the most efficient manufacturing set up but it is achieving a manufacturing set up that meets the business strategy requirements in the best fashion. On the other hand a fully developed manufacturing strategy is even expected to have proactive role in deciding the strategic goals for the business unit. For instance a manufacturing organization designed for faster product development and product introduction can leave a considerable impact on the business strategy and its competitive priorities. This stage of manufacturing strategy is recognized as a stage of externally supportive manufacturing strategy by Wheelwright & Hayes (1985). This is said to be the most complete form of manufacturing strategy and is discussed elsewhere.

## STRUCTURAL DECISIONS IN MANUFACTURING STRATEGY

If we look at the content of manufacturing strategy, it is nothing but a set of structural decisions about manufacturing taken over a time period that complement each other towards achieving the business goals (preferably stated in terms of cost, quality, delivery and flexibility



requirements). For instance if "Minimum cost to the customers" happens to be the prized strategy for the business, then many structural decisions should be taken in order to achieve this goals collectively. These decisions would be aimed at mass production, standardization of products, automation, just in time production, efficiency and productivity improvement, use of information technology and computers etc.

There have been attempts to classify and categorize these essential structural decisions in to groups or decision categories. One framework of decision categories suggested by Wheelwright and Hayes (1983) has been quite successful in identifying the component decisions in Manufacturing Strategy. This is shown in table (1).

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**Table(1):Decision categories composing Manufacturing Strategy**

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1	Capacity	- amount, type, timing
2	Facilities	- size, location, focus
3	Technology	- equipment, automation, connectedness
4	Vertical Integration	- direction, extent, balance
5	Workforce	- skill level, pay, security
6	Quality	- defect prevention, monitoring, intervention
7	Production planning/ materials control	- computerization, centralization, decision rules
8	Organization	- structure, reporting levels, support groups

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Discussion on the decision categories and some modifications in Table (1) have been dealt with in the further chapters.

The complementary and mutually supportive decisions taken in all these decision categories tend to build manufacturing strength in some direction. It is this collective and conscious decision making in these decision categories that determines the capability and strength (and because of the trade-offs involved in all these categories, weaknesses) of any manufacturing unit. They are the direct result of the pattern of decisions pursued in the past. Wheelwright (1984) defines the manufacturing strategy as "it is this pattern of structural decisions over time that constitutes the manufacturing strategy of a business unit". He also observes that it is critical that the decisions made be consistent with decisions made at other point in time and in other categories.

## COMPETENCE AND CONSISTENCY

By far there are two most important aspects central to defining, developing and implementing a successful Manufacturing strategy. First, and foremost, is a clear understanding of the competitive mechanism used by the business. This is the single input to formulation of manufacturing strategy and hence should be thought-out clearly. The manufacturing design to excel in one direction will be able to do so in another direction with immense difficulty and probably poorly. A system designed for "cost minimization" cannot offer "product flexibility or volume

flexibility" so easily. Basic to choosing a 'competitive method' lies clear understanding of the market forces. For quite some time now, the US manufacturing industries are facing an impossible competition from the Japanese industries. The Japanese competitive edge of 'quality' had become well known at a time when US industries were still practicing the 'cost' minimization policy. Now as the world is taking to 'quality' seriously (US and European industries included), Japanese industries are fast moving into another competitive gear of 'Manufacturing flexibility'. Still the importance of selection of a proper "competitive weapon" cannot be overstated, because as said previously, changing the focus of manufacturing function from one direction to another at a later stage would be "too expensive a strategic error".

The second most important aspect in developing and implementing a successful Manufacturing strategy is the 'consistency' between Manufacturing strategy and the overall business strategy, and consistency among various decision categories within the Manufacturing strategy.

## 2. LITERATURE AND OVERVIEW ON MANUFACTURING STRATEGY

The literature on Manufacturing Strategy is recent and very small. We can see two main trends in this literature. One set of researchers have concentrated on building theoretical background for manufacturing strategy. They have tried to conceptualize manufacturing strategy and find out the relevant factors in manufacturing strategy. The basic contents of manufacturing strategy are due to these pioneering researchers (Skinner, Wheelwright, Hayes, Buffa, Hill etc.). Another set of researchers have tried to give a formal and empirical structure to the thinking on manufacturing strategy (DeMeyer, Ferdows, Lindberg, Horte, Hax, Clark, Richardson, Gordon, Fine etc.).

A prime motivation for study of manufacturing strategy was to explain and reason the loss of competitiveness of US industries over a period of time. Skinner (1969) first sensed the continual neglect of manufacturing in US industries. Then a series of papers were published in the Harvard Business Review on thinking strategically about the manufacturing, analyzing the manufacturing competence, comparing the US industries against the Japanese industries and suggesting the possible improvements in US manufacturing to overcome the Japanese and growing European competition.

Skinner (1969) felt that the continual neglect of manufacturing by the top management was because they thought manufacturing was too technical to deal with. The industrial engineers and the computer specialists need the top management commitment and advise in setting up the

manufacturing for competence. His "Millstone effect" of corporate neglect and thinking of manufacturing for only cost reductions was also supported by some examples. He criticized a large amount of delegation of decision making in manufacturing to lower levels. The personal inadequacy, and lack of understanding of the trade-off involved, by the top managers caused a pattern of failures. He was also the first to give five categories of decisions where such trade-off were involved (Plant and equipment, Production planning and control, Labor and staffing, Product decision/engineering, Organization and management). The paper also discussed a model for thinking strategically about manufacturing and policy making for manufacturing.

## THE CONCEPTS IN MANUFACTURING STRATEGY

### Product versus Process Technologies

Many of the salient features and the conceptual clarifications in manufacturing strategy were built over a period of time. It was opined (Skinner 1984) that innovations in process technology and equipment can be used to strategic effect as a powerful competitive tool. The traditional wisdom of R&D investments in products rather than process development is questionable. The investment in process development results in low cost, superior quality, shorter delivery time, lower inventory and a new production economics. This basic change in orientation is hindered by several factors, namely, short term financial emphasis (Banks R L and Wheelwright S C 1979), conventional practice of looking at corporate performance in terms of only the annual reports, capital budgeting based on ROI rather than on

strategic analysis, aversion to taking risk on Equipment and Process Technology (EPT) and conservative management thinking. Recently some of the most serious risks in investment in EPT (e.g. too expensive for their benefits, inflexible etc.) have been removed by the introduction of computerized manufacturing. The EPT is changing and it no longer clashes with the marketing realities like shorter product life cycles, demand fluctuation etc. EPT now allows shorter product development time higher volume and product flexibility to deal with the marketing realities. It makes job-shop, short-run, product specialized plants to run more like process type, long-run and high volume factories.

Hill (1983) developed a model for visualizing the strategic role of manufacturing. The strategic role of manufacturing is to serve two ends namely,

- 1) To provide a manufacturing process that will give a distinctive competence, not based on the marketing due to product development but due to process development.
- 2) To offer a better performance criteria to justify the investment in manufacturing infrastructure.

However more often than not the computerized control systems fail to achieve the ends for which they are installed (Miller, 1981). The rising concerns about declines in productivity, excess inventories, missed shipments, customer complaints, material shortages, etc. have been attributed to superficial causes such as bad forecasts, data inaccuracy etc. The basic causes are far deeper and arise out of design decisions about manufacturing.

## Decision Categories

Thus basic decisions are about system architecture, priorities, reflexes, focus, technology & organization (Wheelwright, 1983) form an exclusive set when we consider the manufacturing control processes. The system can be either "decoupled" i.e. more localized and autonomous sub-units thus allowing more flexibility required in making rapid changes or "coupled" i.e. information and decisions flowing through a control coordinating system, thus allowing more controls over costs. For a job-shop type of production another crucial decision area is regarding setting the priorities for job loading. Resultant of the above two decisions are the differing reflexes of companies for customer needs. The ideal 'Focused Factory' (Skinner, 1974) would be designed to produce one product or product group so that the compromise that arise otherwise can be avoided. But nature of the equipment and plant economics does not often allow ideal Focused Factory. So a focused manufacturing control is suggested (Miller J G 1981) which allows control over each product line as closely as possible. But it induces certain stresses on the manufacturing. These can be taken care of by adopting certain organizational technologies (Miller J G, 1981) or liaison devices (Miller D, 1987). It also calls for clearly defined responsibilities for managers (Miller J G 1981, Miller J G & Gilmour 1979).

The strategic investment in newer plants (Schemenner, 1979) is much more than looking for the obvious plant location. The location has many implications for product/plant/market strategies. These and the critical

issues about scales of economies in production while making the investment decisions in plant/capacity expansion/or process technology are analyzed (Schemenner R W, 1976). Such scrutiny clarifies a number of issues thus providing strong support for final decision making about EPT.

### Short versus Long Term Goals

Another basic discussion very closely related to the process and product technology investment is trade-off between short-term and long-term goals (Banks R L and Wheelwright S C, 1979). The attainment of long range goals involves resource commitments that may reduce the profits in current period. There is a constant pressure on managers to show increasing profits year after years. The trade-off in short-term and long-term goals result from capital restrictions. A related factor is that the performance of managers is evaluated only on short-term profits and not on their strategic commitments.

The strategic implications of the Factory of Future (Jelenik M, Goldhar J D, 1984) need to be clearly understood by the top management as well as the operating managers. The new economics of production i.e. economies of scope rather than economies of scale (Panzer J C , Willig R D, 1977) introduced by computerized production again throws open the question of process technology versus product technology.

The traditional method of performance measurement for the manufacturing and the operations managers (Craig C E, Harris R C 1973) in terms of efficiency has its own bugs. A strategic approach to manufacturing performance evaluation (Richardson P R, Taylor A J and Gordon J R M, 1985) should



instead be based on a match between the corporate missions and the manufacturing tasks at trend. Total Factor Productivity (Hayes R H, Clark K B, 1985) if offset against strategic and managerial variables acts as a good measure for manufacturing performance. Some attempts are also made to measure the intangible factors such as innovativeness (Bigoness W J, Perreault W D (Jr.), 1981).

### The Nature of Trade-Offs

Traditionally manufacturing choices have been described as trade-offs between cost, quality, volume, delivery and design (Richardson P R, Taylor A J and Gordon J R M, 1985) or more simply as cost, quality, flexibility and delivery (Wheelwright S C 1981). Some authors (Arnoud DeMeyer, Nakane J, Miller J G, Ferdows K, 1986) have extended 'delivery' to include delivery dependability, delivery speed and after sales service.

Correct identification of critical trade-offs can determine the firms' eventual success or failure (Richardson P R, et al 1985). These trade-offs must be made because it is impossible to excel in all of them simultaneously (Fine C H, Hax A C, 1985). There is a necessity to choose and to concentrate ones efforts on a limited set of capabilities (usually one of the generic four) (Hayes R H, Wheelwright S C, 1984). This view of the trade-offs suggests that the priority given to one of these four is at the cost of others. However, the nature of these trade-offs seems to be more complicated than what is assumed. There has been no empirical evidence yet to show the assumed relationship among

the trade-offs.(i.e. one particular strength can be built at the cost of other). On the other hand there are studies to support the fact that the trade-offs are not as simple. The cost and quality relationship, as seen by many companies (Juran, Gryna, Bingham 1974, Skinner, 1986) is that the investment in quality also results in lower costs. Among other trade-offs, higher flexibility is associated with higher dependability (Jaikumar, 1986). The cost and service trade-offs and their implications on the logistic systems in a business have been studied (Donald B, Rosenfield, Roy D, Sharpio and Bohn R E, 1985).

Narrowing further these trade-offs, some literature on business strategy suggests only two generic categories, namely, 'Low cost' and 'differentiation' (Gupta A K, 1987). The generic strategies according to Porter's classification (Porter M E 1980), are low cost, differentiation and focus. This was further supported by empirical evidence (Dess G G, Davis P S, 1984 and Hambrick DC 1983). In this generic classification (i.e. low cost and differentiation) of competitive strategy the differentiation refers to delivery, quality, flexibility and other factors (Dess G G, Davis P S, 1984). Yet another study (Jones G R, Butler J E, 1988) argues that even low cost and differentiation strategies are not mutually exclusive. They explain, using a transaction cost model, that underlying both the strategies is a single cost trade-off. So instead of viewing low cost and differentiation strategies as the two ends, they propose a continuum characterized by different proportion of two underlying costs viz. the transaction costs and production

costs.

Each of the four dimensions of the trade-off (cost, quality, dependability, flexibility) at the aggregate level is a result of a number of contributing variables (Swamidass P M, Newell W T, 1987). Some of the variables such as the use of Just-in-Time (JIT) may contribute to more than one of cost, quality, flexibility and dependability. Because of such common factors, strengths are usually built in more than one of the four trade-offs. So while making a choice among the four trade-offs their relationship becomes more complex than what is assumed. Instead of making a choice, a ranking among these trade-offs is also suggested (Hill T J, 1985). However, the exact nature of these trade-offs need to be investigated further.

#### Manufacturing Strategy versus Strategic Inertia

Yet another topic debated for quite some time now is "the inertia to change induced in a business due to the use of highly directionalized plant/technology strategies", (Abernathy and Wayne, 1984, Sinha, 1984).

Product and process life cycle concept (Hayes and Wheelwright, 1979) is useful tool in judging the strategic options and the positioning on the matrix gives choice (in terms of process and products) of how a company tries to position. Each shift on the matrix means a change in product diversity and process flexibility. If the product life cycle moves too fast towards a few more standardized products, then a company which continues to maintain process-flexibility may find it difficult to cope with the price cuts offered by the competitors. On the other hand moving towards process

standardization might lock the company into a set of manufacturing capabilities that will make it difficult to respond to the market changes. Excess concentration in either direction makes the company more vulnerable to attack. Similarly if a company adds more standardized products on the presently flexible manufacturing set up or goes for vertical integration with more non-standardized products then the company is going to face undue stresses.

It is argued that constant improvement in operating efficiency is possible from the learning curves (Andress F J 1954). Learning curve mechanics says that under standardized and constant conditions the mass-hour required for a job reduces by a fixed percentage with every doubling in the cumulative production (Hirschmann W B, 1964). Thus it was advocated that continuous striving can show continuous cost improvements (exemplified by the Ford's model T). Altogether another view of the learning curve is that a manager failing to consider the possible outcomes of following a cost-minimization strategy may find himself with very few other competitive options left (Abernathy W J, Wayne K, 1984). This was exemplified by Ford's loss of innovativeness eventually resulting in loss of market share and profitability. The extreme form of one particular strategy generally results in a strategic inertia thus making the organization vulnerable to structural changes in the market.

Inspite of good efforts by the American companies in strategic planning their competitive position is deteriorating. The complaint is not about malfunctioning of strategic planning but about the harmful aspects of its

proper(!) functioning (Hayes R H, 1985). However, certainly the idea of strategic planning itself is not wrong. Hayes suggests that perhaps the process of planning followed i.e. first by setting objectives, then by defining strategies or ways of accomplishing them and then developing necessary resources, is not correct. Instead he suggests a means-ways-ends sequence for strategic planning. Instead of taking strategic leaps he suggests the incremental model that is practiced by Japanese and German Industries. This is supposed to take away the disadvantage of "strategies becoming too rigid".

The strategic inconsistencies arising between the manufacturing and marketing can be ironed out by developing marketing programs to take advantage of company's manufacturing capability and that manufacturing develops capability to respond to the needs of select market segments (Sharpio B P, 1977).

The concept of 'Focused Factory' (Skinner W, 1974), discussed earlier, can reduce some of difficulties with strategic planning. It avoids the policy conflicts arising out of product proliferation and allows better productivity of the resources committed. Another approach is to use strategic audits from time to time review the decisions and correct for the strategic inertia (Wheelwright S C, 1984).

## **CONCRETE DECISION AREAS IN MANUFACTURING STRATEGY**

A wider variety of decisions than discussed above need to be made for a manufacturing strategy to be comprehensive and concrete. These decisions can be broken down into

analyzable categories. Many authors have given different sets of essential decision categories. For the purpose of discussion let us use a nine factor classification (Wheelwright S C, Hayes R H, 1985) as shown in table (2).

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Table (2): Major Types of Manufacturing Decisions  
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Capacity	Amount, Timing, Type
Facilities	Size, Location, Specialization
Equipment and Process Technology	Scale, Flexibility, Interconnectedness
Vertical Integration	Direction, Extent, Balance
Vendors	Number, Structure, Relationship
New Products	Hand-off, Start-up, Modification
Human Resources	Selection and Training, Compensation, Security
Quality	Definition, Role, Responsibility
Systems	Organization, Schedules, Control

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REF: Steven C Wheelwright and Robert H Hayes;  
'Competing through Manufacturing'; Harvard  
Business Review, January-February 1985: p-101.

### Capacity

The central question of capacity strategy is the decision to add new plant capacity. The decision also includes how to deal with fluctuations in demand (Fine C H, Hax A C, 1985), whether to add capacity in anticipation of the future demand, or whether to respond to existing demand. The factors, along with demand, which affect capacity decisions are the cost trends in new capacity, competitive

environment, government regulations etc. (Leone R A, Meyer J R, 1980). Capacity decisions have large implications for the competitiveness because of the economies of scale involved and the entry barriers to business they create for others. In a wide variety of businesses, unit costs associated with capacity additions using the most up-to-date technology have followed a U shaped curve (Leone R A, Meyer J R, 1980). Each side (RHS and LHS of the U shaped curve has its own implications for capacity strategies in terms of timing, scale, location and technology. Thus it is very necessary for the managers to check economic climate before making capacity decisions.

Capacity decisions are usually interconnected with facility decisions (Fine, C H, Hax A C, 1985), equipment and process technology, vertical integration, vendors and new product development. And besides, the capacity decisions, like almost all other manufacturing decisions, are highly influenced by the dominant orientation, corporate attitudes and driving forces such as growth and diversification (Hayes R H, Schemenner R W, 1978).

### Facilities

New facilities can be added by plant expansion on existing site, by establishing new branch plants or plant relocation (Schemenner R W, 1979). The strategic alternatives about plants can be product plant strategy (same as focused factory), market area plant strategy (branch plants near markets), product-market plant strategy (combines both product plant and market area plant strategies) or a process plant strategy (plants separated based on sub-

processes).

Facility decisions involve the following considerations (Hayes R H, Schemenner R W, 1978):

- 1 Total amount of manufacturing and logistics capacity to provide for each product line over a time period.
- 2 Break-up of this capacity into operating units (plants, warehouses etc.), their size and form, location and focus.
- 3 Equipment and process technology used.
- 4 The span of process (i.e. vertical integration).

The decisions regarding focus of facilities usually depends on economics of production and distribution (Fine C H, Hax A C, 1985).

Implications of facilities decisions in terms of cost, quality, delivery and flexibility are highly pronounced and are direct. Implications of facilities (Logistics Systems) on the cost and service trade-offs are studied (Rosenfield D B, Sharpio R P, Bohn R E, 1985).

The investments required for achieving Focused Factory are usually high, so a more rational approach for achieving required size and focus for facilities is that of a Plant Within Plant (PWP), a notion in which existing facilities are divided organizationally and physically into groups concentrating on unique manufacturing tasks related to each product class.

#### Equipment and Process Technologies

The equipment and process technology investments are usually large. Under the constantly changing technology



trends, these decisions gain more importance as the implications of evolving technologies over the firms' competence are complex. Traditionally the choices were merely restricted to choosing the process types (Project, Job-shop, batch, assembly line, continuous line) and matching the product characteristics with process characteristics (Wheelwright S C, Hayes R H, 1979). Especially when the newer technologies such as Flexible Manufacturing Systems (FMS), Computer Integrated Manufacturing (CIM), have drastically changed the production economics and manufacturing cost structure, better methods of evaluation of EPT decisions are necessary.

Usually the buying, leasing or hiring decisions about the equipments, process technologies and automation are connected with expansion, diversification, new product development decisions, production control or vertical integration decisions.

### Vertical Integration

Vertical Integration involves a variety of decisions concerning whether the business units should provide certain goods or services in-house or purchase them from outsiders instead. Vertical integration is sought to reduce costs, reduce supply uncertainty and increase autonomy. It also improves control over transaction cost and coordination, and increases the barriers to entry of competitors. However, it requires further capital & may lead to unbalanced throughput, reduced flexibility, and loss of focus (Buzzell R D, 1983).

The dimensions of vertical integration are as follows

(Harrigan K R, 1985).

- 1 Stages of Integration - The number of steps in the chain of processing which a firm engages.
- 2 Breadth of Integration - No. of activities the firm performs at any particular stage.
- 3 Degree of Integration - Value added within the business unit.
- 4 Form of Integration - Nature of ownerships in the integrated units (Hayes and Abernathy, 1980).

The forces affecting choices of vertical integration are cost of business acquired (Fine C H, Hax A C, 1985), phase of industry development, competition, bargaining position of firm and the firm's strategies (Harrigan K R, 1985).

The profitability of vertical integration was analyzed by Buzzell (1983) based on a study of 1649 firms in various industries. It was conclusively shown that vertical integration will pay-off for those businesses who enjoy strong market positions but for others the outcome is doubtful.

The literature on vertical integration and strategy however does not always distinguish between forward or backward integration. It also remains to be seen as to what kinds of business environments and cost structure are more favorable to forward or backward integrations.

Moreover, ownership of integrated units may not itself produce benefits of integration. The crucial element for success of vertical integration is coordination and management of the series of processes at different levels.

## Vendor Relations

There are two diametrically opposite views prevalent on vendor relations. Namely, competitive approach and cooperative or "Japanese" approach (Porter, 1980). The competitive approach develops multiple sources for supply of a single unit and uses this competition among vendors as a threat. The cooperative model believes in long-term joint working to increase vendor efficiency. In either case if the vendor strategy is successful it reduces the supply uncertainty. Thus a successful vendor strategy can be used in order to avoid vertical integration and related problems of inflexibility, large capital requirement etc.

There are many practical issues in vendor relations such as vendor quality level, cost of vendorized products, vendor financing and size and structure of vendorization.

Issues on vendorization are closely linked with decisions on production control, vertical integration, quality decisions, and new products.

## New Products

Product proliferation poses serious questions on efficient working of manufacturing operations (Hayes R H, Schemenner, 1978). In a firm where growth or diversification are important, the manufacturing systems and logistics systems should be designed to accommodate more flexibility. The issues on new products introduction reflect heavily on the type of layout (Process or product layout), vertical integration, vendors etc.

The attitude on growth is particularly important in establishing the likely perspective on manufacturing as a

competitive weapon. In business in which growth is a primary motivating factor, the role of manufacturing often becomes one of the simply 'Keeping up' with the growth as opposed to providing other characteristics to the products and services being delivered to customers (Wheelwright S C, 1984). Thus in high-growth business the primary thrust of manufacturing is getting out products, and that tends to take precedence over establishing a competitive advantage on other dimensions of manufacturing capability. In business where growth is not a 'prime motivating' factor, the opportunities for establishing manufacturing as a critical input to the business strategy are greater (Wheelwright S C, 1984).

#### Human Resources

Under the changing environmental and technology conditions the content of human resources of a firm is also shifting (e.g. percent of professionals etc.). As technology becomes more prominent, human resources management also becomes more complex (Peters and Waterman, 1982). Of the principle issues in human resources management, selection and training are gaining more and more importance.

The objectives for human resources policy design have been 1) development of skills and potentials of personnel 2) maximizing output of personnel 3) minimizing the cost of production. However, the detailed policies like whether compensation be linked to productivity or to clock hours etc. need careful consideration of the goals of the organization.

Yet there is a clear need for more research on the implications of human resources policies under the fast changing technology trends.

## Quality

Much has been said and written about the importance of quality (Grant and Leavenworth 1980, Burr 1976, Juran and Gryna, 1980), Deming, 1983, Schonberger, 1982). The critical factors in successful quality improvement strategy are 1) top management commitment 2) a well articulated philosophy 3) a concrete objective 4) specification and allocation of responsibilities.

New quality programs such as quality circles, quality of work life, zero defect, total quality control etc. are being practices in Japanese industries with a very high success rate.

Quality decisions are closely linked with the vendor strategy, production control, human resources strategy and equipment and process technology strategies.

## Systems

This refers to decisions on the organizational infrastructures. A strong organizational infrastructure is essential to support decision making and implementation. Planning and control systems, organizational structure, responsibility and authority form the basis for systems design (Fine C H, Hax A C, 1985). Integration of various systems plays a crucial role in a firm. The computerization and integration aspects are discussed in a study on European manufacturers (Ferdows K, DeMeyer A, 1985). There are many new systems technologies such as Just-in-Time, Total-Quality-Control and Computer Integrated Manufacturing (Gunn, 1987). Systems decisions are extremely vital and crucial for

developing a lasting manufacturing competence. These decisions have much bearing on the production cost structure and the organizational reflexes. These systems and productivity strategies can be aligned with business strategies in practical ways for reaping maximum benefits (Judson AS, 1984).

Returning to Table (2), we can see that the first four factors are generally viewed as structural or more "strategic" because of their long-term nature. It is difficult to reverse or undo decisions in these four and they require substantial capital investments (Wheelwright S C, 1984). The last five categories are viewed as less strategic because of their short-term nature. But it has been suggested that cumulative effect of these can be as difficult to reverse as the previous four categories (Abernathy, Clark, Kanthrow, (1981). The Japanese approach seems to be to view the last five categories also as equally strategic in nature (Wheelwright S C, 1981, Hayes R H, 1981).

A classic example of a well conducted manufacturing strategy, discussed by Wheelwright, (1981), is as follows:

Company: Tokyo-Sanyo-Electric.

Directive from Executive Vice President: Reduction in  
inventories

Translated into:

- \* standardize parts in marketing and engineering.
- \* increase vendor frequency from four-times-a-month to four-times-a-day.
- \* mixed model assembly for low volume products.
- \* reduce change over time through change in

equipment.

- \* produce frequent, small lot size runs.
- \* reduce warehouse space.

Results: A 729% increase in profit for 1979 over that of 1975.

## THE PROCESS OF BUILDING MANUFACTURING COMPETANCE

The manufacturing strategy content (the competence) can be separated from the process (formulation and implementation) (Swamidass P M, Newell W T, 1987). Most literature (Skinner W, 1969, 78, 85, Miller J G, 1981, Wheelwright, 1978). has suggested an essentially top-down formulation approach. Whereas Hayes and Wheelwright (1984) see a need for an interactive approach for development of manufacturing strategy.

A much needed framework for visualizing the strategic capabilities of manufacturing in a stagewise description has been developed by Wheelwright and Hayes (1985). Their framework outlines along an evolutionary continuum, the roles of manufacturing in formulating and achieving various goals of the organization. They also clarify the key managerial choices at each stage. An outline of the framework is shown in table (3). It shows that firms may be either in stage 1 or 2 or 3 or 4. A firm in stage 4 is the most forward-looking and a firm in stage 1 is the least.

## SUCCESSFUL IMPLEMENTATION OF MANUFACTURING STRATEGY

The literature cites many examples of successful implementation of manufacturing strategies and the relevant factors in implementation.

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**Table (3): Stages in Manufacturing's Strategic Role**  
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Stage 1	Minimize manufacturing's negative potential: "Internally Neutral"	a) Outside experts are called in to make decisions about strategic manufacturing issues.  b) Internal detailed management control systems are the primary means for monitoring manufacturing performance.  c) Manufacturing is kept flexible and reactive.
Stage 2	Achieving parity with competitors: "Externally Neutral"	a) "Industry practice" is followed.  b) The planning horizon for manufacturing investment is extended to include a single business cycle.  c) Capital investment is the primary means for catching up with competition or achieving a competitive edge.
Stage 3	Provide credible support to the business strategy: "Internally Supportive"	a) Manufacturing investments are screened for consistency with the business strategy.  b) A manufacturing strategy is formulated and pursued.  c) Longer term manufacturing developments and trends are addressed systematically.
Stage 4	Pursue a Manufacturing base competitive advantage: "Externally Supportive"	a) Efforts are made to anticipate the potentials of new manufacturing practices and technologies.  b) Manufacturing is involved "up front" in major marketing and Engineering decisions and vice-versa.  c) Long range programmes are pursued in order to acquire capabilities in advance of needs.

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 REF: Steven C Wheelwright and Robert H Hayes; "Competing through Manufacturing"; Harvard Business Review; January-February 1985: p-100.  
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Martin (1987) discusses the Allan-Bradley experience and its success with strategic planning for manufacturing. The author identifies a need for concrete, measurable success factor for the business. The implementation of strategic planning for manufacturing is nothing but fixing up of the strategic gap between what the company is presently and what the critical success factor demands. The author recognizes these critical success factors as competitive delivery, Asset Utilization Quality, cost, new product introduction, Business Systems and human resources.

Wheelwright and Hayes (1985) discuss two examples namely General Electric Dishwasher and IBM. The paper discusses factors relevant during the transition process of strategy implementation. Another paper (Fine C H, Hax A C, 1985) discusses in detail the implementation efforts for manufacturing strategy at Wire and Cable Unit of Packard Electric, Division of General Motors. Techniques developed for application of manufacturing strategy were discussed in a paper (Meyer R J, Agarwal K K, Beckman S L). Three specific issues, viz. Degree of Vertical Integration, choice of process Technology and Management Systems were discussed along with product segmentation and organizational issues.

Four major areas viz. market needs, product technology, production technology and organization, need to be understood for defining the role of manufacturing (Gudnason C H, 1984). The author advocates that a production strategy exist in production technology, plant layout, ppc and organizational management.

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## EMPIRICAL STUDIES IN MANUFACTURING STRATEGY

Thus far, in evolution of manufacturing strategy theory, case study, anecdotal experiences etc. have played the central role with very limited empirical research (Swamidass P M, Newell W T, 1987). However recently some empirical studies are conducted.

Richardson et al (1985) report a study of manufacturing missions and tasks conducted on Canadian Electronics Industry.

Recently a large project has been started on a global level ("Global Manufacturing Futures Project"), administered in North America by J G Miller and A Roth (Boston University), in Japan by J Nakane (Waseda University, Tokyo) and in Europe by K Ferdows and A DeMeyer (INSEAD, Fontainebleau), with an aim of making a large data base on manufacturing management available for academicians and managers. As a result of this data collection many papers on the empirical hypothesis testing for manufacturing strategy have started appearing (A DeMeyer and Ferdows K, 1987, Ferdows K and Lindberg P, 1987, Horte S A, Lindberg P, Tunalv C, 1987). These studies have been able to find typologies for manufacturing strategies in European, Japanese and American industries. They have also been able to show statistically the differences in manufacturing competences that exist between various nations.

Through all these efforts a comprehensive picture of manufacturing strategies is evolving. Though a large number of concepts have been identified, it lacks scientific development of these concepts, integration of literature from

several other functional disciplines in Business Management. A large number of empirically tested models need to be developed in order to formalize and give a direction to the manufacturing strategy literature. There is a need to establish linkages between the business strategy and manufacturing strategy. And it is perhaps time to re-visit the traditional ends-ways-means model and evaluate it empirically.

### 3. PURSUIT AND PLAN OF THE STUDY

#### OVERVIEW

Initially, a set of research questions was generated prima-facie for this exploratory work. The nature and content of these questions was broad based and relating to Indian manufacturing industry in general. The specific questions generated were:

- a) What is the comparative picture of manufacturing strategies followed in Indian Manufacturing industries?
- b) Are there any remarkable differences in Manufacturing Strategies?
- c) What are the determinants of Manufacturing Strategies? (such as environment, ownership pattern, organizational structure etc.)
- d) What happens because of manufacturing strategy to the variants such as Performance, Market competence etc.?
- e) How is Manufacturing strategy actually related to other Corporate or Business level strategies? and,
- f) What kinds of Manufacturing Strategies succeed?

After a detailed literature survey the aforethought questions were analyzed for their relevance and researchability and were refined accordingly. For the purpose of present study the following objectives were set forth:

- a) To determine, what strategic differences exist in the manufacturing of different industries that provide a sustainable industrial competence?
- b) To determine the kinds of linkages between manufacturing strategy and business strategy.
- c) To evaluate the relationship of performance with manufacturing strategy and business strategy combinations.

The underlying assumption for this study is that the firms are likely to have differences in strategic preferences. This assumption has been supported by both conceptual (Porter M E 1980) and empirical (Dess G G, Davis, P S 1984, DeMeyer et al, 1987 ) studies. Further specific strategic group memberships for firms also has been identified empirically. (Dess G G, Davis, P S 1984, Hambrick, D C 1983). By contrast the firms which fail to have a strategic group membership have been said to be of 'stuck in the middle' kind. Dess and Davis (1984) have studied the performance of the strategic groups versus those that are 'stuck in the middle' and report that firms identified with at least one generic strategy out perform the latter.

The nature of this investigation calls for a broad based and survey oriented research methodology. The measures for intended strategies require a multivariate research tool which has a general applicability. Keeping these in mind a mailed questionnaire based survey of Indian Manufacturing Industries was thought of. The design of this survey, the description of selected sample etc. are given in the

following sections.

## QUESTIONNAIRE DESIGN

In order to achieve the aforesaid objective a data collection tool was designed, which helps us in collecting data on relevant strategic aspects of a firm. The questionnaire is divided into 5 sections (APPENDIX-A).

The first section is about structural decisions in manufacturing. The section contains questions about all the decision categories relating to manufacturing strategy. This section has been included in order to study the realistic patterns of manufacturing decisions in all decision categories. Preferences and practices of a firm in expansion, plants, equipment and process technology, vertical integration, vendors, new products, work force, quality, production planning, computerization, organization, manufacturing process and environmental uncertainty are measured on multidimensional scales. This section helps us to form a picture of firm's present practices and future preferences in manufacturing related areas. Most items have sufficient alternatives for the respondent to choose from. In case of ambiguity or non-applicability, clarification is sought so that an analysis of these additional alternatives could be made later.

Section 2 of the questionnaire concerns about the business strategy. The items included here form a comprehensive set of strategic directions for a firm's market/product decisions. 13 different strategic directions are listed in this set, e.g. Market penetration and market

share building, establishing quality surviving against competition. The variables measure the attached degree of emphasis to each item on a 5 point scale (1 very low to 5 very high). The section helps us understand strategic directions of firms.

Section 3 elicits competitive strategies adopted by the firms. A list of 17 such competitive methods relevant to Indian industries is given, e.g. competing on the basis of product quality, cost, advertising etc. The respondent is asked to indicate the attached importance of these competitive priorities to his firm on a 5 point scale (1 no emphasis to 5 critical emphasis). Data obtained on these dimensions provides us the picture of competitive mechanism followed by the firm.

Section 4 is about manufacturing action programmes (presently under progress or to be taken up in coming two years), e.g. introducing CAD, improving employee training etc. A set of 58 specific action programmes measures the degree of emphasis on these programmes on a 5 point scale (1 very low to 5 very high). Analysis of action programmes taken, rather than that of perceived importance of such plans gives a better understanding of the manufacturing strategies followed (Wheelwright S C 1984, DeMeyer et al. 1984) by a firm. The manufacturing strategy will be reflected in the actions and efforts to which the manufacturers are committed. The questionnaire does not focus on actions or objectives in the distant future, but to measure the emphasis respondents place on certain efforts and actions over ensuing two years. The 58 action programmes are selected based on their

strategic importance. The criteria for judging an issue to be of strategic importance is based on (Ginsberg A, Venkataraman N 1985).

- a) The strategic relevance of an issue or its potential for impact on existing or contemplated strategies,
- b) The actionability: i.e. is it actionable,
- c) Critically: degree of impact, and
- d) Urgency: the time period it merits.

Though list of possible action programmes can be innumerable large, those programmes which have strategic importance and which are relevant to Indian manufacturing were chosen to represent the action programmes in this section. The seed action programme list was taken from DeMeyers et al (1987) which was further developed upon.

Section 5 evaluates the performance. The criterion for performance used here is a 10 point factor scale for subjective evaluation of the performance by a senior executive or the Chief Executive as against his/her a priori expectations. Each factor is measured on a 5 point scale (1 poor to 5 excellent). This scale was preferred over the actual objective data for two reasons. Firstly, it has been observed by previous researchers (Lawrence P R, Lorsch J W 1967) that even with the assured confidentiality of organizational identity it is virtually impossible to obtain vitally important data. Secondly it is expected that the absolute financial performance would depend not only on the effectiveness with which a firm implements its chosen strategies but also on the state of economy, industry



characteristics and the choices of strategies themselves (Lenz R T 1981). Thus even if vital financial data could be obtained, they would be meaningless from the perspective of this study unless the effects of economy etc. are accounted for. In light of these considerations and the fact that managers' apriori expectations of performance are likely to take care of expected effects of Industry, economy and strategy related factors (Gupta A K 1987) the scale based on apriori expectations is used. This method of measuring perceived performance also is reported (Heneman H G 1974) to have a very high correlation with actual performance. The 10 factors used in measurement are also weighted for their relevance to the firm as a measure of performance by the same respondent. Such a multifactor approach with weighted criteria seems effective in taking into account differing priorities implied by different strategic contexts (Steers R M 1975, Lewin & Minton 1986).

The last section elicits General Information about the company, business unit, products and financial indicators. Information from this section has been used for drawing a general profile of the respondent organizations.

## VARIABLES AND THEIR MEASUREMENT

Since a large number of variables are measured in this questionnaire, it would be worthwhile to discuss how different variables are arrived at and the rationale of their effectiveness in measuring the underlying attributes of strategy. The references are made to the origin of these scales wherever applicable.

1     Projected Expansion: The important constituents for an

expansion decision are area for expansion, size of expansion, mode of expansion, timing, sources for technology and equipment. The size of expansion is measured on two dimensions, viz. expected investment in expansion over planned horizon and relative size of expansion as compared to present size of enterprise (major, medium and minor). Mode of expansion and timing of expansion are largely dependent on economic environment. The alternatives suggested (Leone R A, Meyer J R 1980) are new capacity creation or acquisition and building full capacity or incremental capacity building respectively.

The popularly followed alternatives by Indian manufacturers were provided as sources of Technology and Equipment.

2. Plants : Two dimensions relevant to plants and facilities were measured. i) The plant focus (Skinner W 1969) was measured on the number of products produced in each plant (of one kind/of small variety/of large variety) ii) The location preference again is a function of overall economic situation (Leone R A, Meyer J R 1980). Two variables (multiple/single location and situation of the plant in backward area/industrial concentration/upcoming industrial area) were used for measuring the location preference.

3. Vertical Integration : A simple definition of vertical integration (% value added within the plant) was used. The respondents were also asked to mention any expected change in this figure.

4. Equipment and Process Technology: This was measured with respect to equipment mix (mostly general purpose to

mostly special purpose), importance of manufacturing automation to the plant (1=low to 5=critical), investment in automation as compared to other capital expenditure (1=negligible, to 5=extremely high), extent of automation (a-few machines to c-fully automated) and types of jobs automated. These variables were derived from scales on "measuring commitment to new technology" (Noorie H 1958).

5. Vendors: Issues of importance in vendorization are structure of vendorization (size, number and composition of large and small vendors), supply time, quality of vendorized products and motivation for vendors. The vendor product quality improvement methods are a) tightening acceptance b) stressing importance of quality c) working with vendors on process control d) working jointly on products and process development e) Utilizing competition between vendors (DeMeyer et al. 1985).

6. New Product Development: Intensity of new product development in the business unit was measured on 4 dimensions frequency of new product introduction, product variety (range), number of new product features introduced per year and product innovation efforts (R&D). The scales provided are comparative (1=Least aggressive in the industry to 5=most aggressive in the industry).

7. Quality: Two separate measures are used. One is a quantitative measure - total cost of maintaining quality i.e. cost of defect prevention, detection, and over all quality management as percent of manufacturing cost. Second measure is scaled (1=poor to 5=excellent) to study managers satisfaction regarding Defect Prevention Quality Monitoring,

Clear definition, Level of commitment of Managers to quality and level of commitment of workers to quality.

8. Organization: The items measured are technocratization, Liaison devices, control devices and the number of levels in the organization. Technocratization is measured on two variables

- i) Nature of personnel in decision making (1=mostly experienced personnel to 5=mostly technically trained)
- ii) % of professionals in the plant.

Liaison devices such as inter departmental joint committees, project groups etc. are measured on their frequency of use (1=rare to 5=extensive). Control devices use is also measured on a similar scale. (Miller D 1987, Inkson et al 1970).

9. Environmental Uncertainty: This is measured as the amount of uncertainty faced by the plant (1=highly predictable to 5=highly uncertain) in the 6 elements of environment viz. Actual users, Vendors, Competitors, Government regulations, Public attitude and Trade unions (Swamidass P. et al. 1987).

## DATA ACQUISITION

The questionnaire was mailed to 500 manufacturing concerns in India. The selection of companies was made from various industrial and stock exchange directories. The companies to whom we sent the questionnaire included those in the fields of Engineering, Automotive, metals, Cements, Papers, Fertilizers, Chemicals, Cotton Textile, Manmade

Fibers, Pharmaceuticals, Electrical, Electronics and Computer Manufacturers. The survey by design avoided concentration or restriction to some particular fields.

In each case the questionnaire was mailed to the plant offices instead of the Head Office. The Chief Executive or the manufacturing Head was asked to fill in the questionnaire. The Chief executive is of course most important in strategy formulation (Chandler AD 1962). However, since most of manufacturing decisions are taken by the manufacturing head, it was thought pertinent to approach either the chief executive or the manufacturing head. The questionnaire was attached with a covering letter assuring confidentiality of data and anonymity of the respondent.

Prior to actual mailing of these questionnaires, a limited field trial of the same was conducted among the chief executives of local industries in order to ascertain clarity and applicability of the questionnaire. Reviews on field trials helped us to refine the questionnaire further.

The response from industry was around 4% . A total of 17 responses are received. This small sample size though regrettable is not uncommon in the study of strategies (Porter, ME, 1979). Extensive multivariate analysis also have been carried out on similar sample sizes (Dess G.G, Davis P S 1984).

#### 4. RESULTS AND ANALYSIS

##### SAMPLE AND RESPONDENT PROFILE

The analysis here is based on 17 responses that were received from various industries such as cement, textile, cosmetics, metals, engineering, chemicals, petrochemicals, laminates etc. Most of respondents have based their data on their "Business Units" rather than on entire company.

This sample of Indian firms can hardly be considered representative. It is perhaps conceptually and pragmatically infeasible for us to aim at such representativeness of data. However, the range and median characteristics of respondent business units is given below to describe the sample.\*

The respondent business units have a median annual sales of Rs 202.7 cr\*\* (Rs 1400 cr) (The bracketed values show the range). The median gross profit was 8.6% (36%) of net sales, net sales had grown by 24% (207%), net profits had grown by 88.9% (221%) annually. Financial characteristics (median) of the respondents is shown in table (4).

The market share for median respondent's primary products happens to be 20% (96%). His production forecast for 1989 is 15% (34%) above that of 1988 (in terms of number of units).

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\*Median is used because it is less sensitive to outliers as compared to average.

\*\*All values averaged over last 4 years.

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**Table (4): Median Financial Characteristics of the sample**  
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Sales (Rs)	202.7 cr
Gross profits as % of net sales	8.6%
After tax Profit as % of net worth	2.26%
R&D as % of Sales	0.701%
% growth in net sales	24.0%
% growth in net profits	88.9%

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**Table (5): Median Cost Structure of the Firms in the Sample**  
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Manufacturing costs as % of Total                      76.8% (90%)

Break up of Manufacturing Costs

a) Raw material, semi-finished and equipment:	63% (89%)
b) Direct Labour:	18.4% (22%)
c) Fuel and Energy:	17.5 (39%)
d) Manufacturing Overheads:	9.8% (28.6%)

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**Table (6): Median Number of Employees**  
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Total Number of employees                      1683 (7659)

Managerial	130 (1922)
Staff	237 (5414)
Others	1316 ( 603)

Manufacturing Workfoce

Direct	1284 (2700)
Indirect	122 ( 438)

-----

The median cost structure is shown in Table(5) .

The median growth budget for next year (offset equally over the planned horizon) is Rs.4 cr (24.11 Cr). There is 6% (15.2%) spending of manufacturing cost on quality (detection prevention and management). Plants employ qualified personnel (such as CAs, MBAs, Engineers) to the tune of 20%

of total manpower.

The median number of employees and the breakup is shown in Table (6).

Most of the firms in this sample are public limited in nature and have foreign tie-ups. Most of them reported net profits after tax, however a small fraction also reported losses.

Aside from statistics, examination of the list gives an impression that the responding companies are important entities in their respective fields.

#### CONSISTENT ASPECTS OF BUSINESS STRATEGIES:

The strategic orientation of the business units was, as described in Chapter 3, measured on 13 different dimensions. In order to explain differences in strategic orientations along a smaller set of mutually exclusive dimensions and in order to increase the comprehension and understanding of underlying basic dimensions for these 13 variables, a Cluster Analysis of variables was carried out.

Initially a Factor analysis of these 13 strategic dimensions was done along with a varimax rotation to determine orthogonal combinations of these dimensions. The factors thus obtained could not guarantee a loading stability due to small sample size of 17, (Mulaik S A 1972). So a cluster analysis of the 13 dimensions (du Toit S H C et al 1986) was done. A four cluster solution was initially perceived which explained for 84.2% of total variation. Finally a 3 cluster solution was adopted after some



reflection on the nature of these clusters. This three cluster solution accounts for 78.6% of total variation and is shown in Table(7). Note that a cluster of dimensions here implies that the values of firms on dimensions within a cluster or aspect are highly correlated.\* That is firms, if they emphasize one dimension of a strategic aspect, are also likely to emphasize the other dimensions. Following is a discussion on the three aspects of strategic dimensions thus obtained.

i) Strengthening and Rationalization: This cluster includes dimensions on a) Forward integration, b) Backward integration, c) Growth by acquisition, d) Withdrawal from certain markets and e) making maximum out of present market share.

These dimensions suggest an aspect of firms facing a threat of extinction in some of their present business areas and finding opportunity for strength building in some of their present business areas. Trying to opt out of a few of their present business lines (as suggested by dimension d and e above) or trying to build strength in a few chosen areas(as suggested by dimensions a, b and c above) are the features of this aspect. Thus we have called this strategic aspect as strengthening and rationalization. The dead ends in some

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\*The clustering is done using Pearson correlation matrix for closeness and using Ward's method (Ward, J H 1963). The measure entails that at any stage of a cluster analysis the 'loss of information' which results from grouping of cases in to clusters is measured by total sum of squared deviations of every observed vector from the mean of cluster to which it belongs. At every stage the algorithm minimizes the "error sum of squares" associated with a pair.

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## **i) STRENGTHENING AND RATIONALIZATION**

- a) Forward Integration
- b) Backward Integration
- c) Growth by acquisition
- d) Withdrawal from certain markets
- e) Making maximum out of market share (without concern for market share building)

## **ii) DIVERSIFICATION**

- a) Market penetration and improving market share
- b) Achieving High level of innovation in process or products
- c) Introducing new products for existing markets
- d) Entering new markets with already existing products
- e) Introducing new products for new markets

## **iii) COMPETITION IN PRESENT MARKETS**

- a) Establish product quality to survive against competition
  - b) Enforce cost reduction and control and hence controlling the product cost
  - c) Provide product variety (Flexibility)
-

areas could be due to many reasons such as declining sales, declining profitability, unfavorable market conditions or unfavorable cost structure. The firms generally try to either withdraw from the markets or go for harvesting a process where in they try to make maximum out of present market position without concentrating on market position. A technique commonly followed in harvesting is to shoot up the prices of products which are in decline stage (thus allowing for a higher profit margin) and thus force an early decay of the product. This strategy also produces a higher cash-in-flow as compared to allowing a natural decay in product life cycle.

The present areas of business where a growth possibility is perceived, are adopted for a strengthening. Backward integration is a strategy of producing in house the hitherto purchase items so that a strength in present product area is built. Similarly Forward Integration refers to acquiring the trade channels and/or further manufacturing stages (necessary to reach the final customer) held by outsiders. Growth by acquisition of business units is another way of selective strengthening.

So, in short we can characterize 'strengthening and rationalization' as the aspect of strategy wherein firms facing 'dead ends' in some of their present areas choose to step out and concentrate on to strengthening in some areas.

ii) Diversification: This cluster includes dimensions of a) Market penetration and share building b) Achieving high level of innovation in product and process c) Introducing new

products for existing markets d) Entering new markets with already existing products e) Introducing new products for new markets.

This suggests mainly a strategic aspect where in the firms push for achieving a high level of innovation in products as well as processes in order to enter all or any new market product combination. Hence we have called this as the strategy of diversification.

Either because of uncertainty faced in present product/market areas or because of opportunity perceived in technological innovations in the firm, firm tries to diversity from its present set up. This is basically different from 'Strengthening and rationalization' strategy in the sense that product/market diversification and 'innovation' are central to this strategy. Emphasis on market penetration and improving market share comes as a 'by product' of this. Though literature on business strategy further classifies diversification as related diversification and unrelated diversification, this break up could not be significantly observed here. This could be attributed to the nature of business units included in this sample or to a relatively small sample size used here.

iii) Competition in Present Market: The dimensions included here are a) Establishing product quality for survival against competition b) Enforcing cost control and reduction in order to provide low cost products to the customer. c) Providing product flexibility (variety) for maneuvering for market

position.

These suggest an aspect where in the firms perceive good prospects and a 'go ahead' situation in their present markets (without strengthening or rationalizing) that is, attempting to compete in existing markets based on either cost, quality or product flexibility. Product flexibility refers to providing a wider product choice in the same product class and hence refers to the same product/market segment (e.g. offering a large variety of designs in same range of clothing). Hence it is not providing new products for existing markets but providing variety in existing product and market.

#### CONSISTENT ASPECTS OF COMPETITIVE STRATEGIES

In order to study the competitive mechanism followed by different firms for achieving market competence a 17 variable measure was used. Factor analysis (5 factor solution) could not guarantee stability of loading, so a cluster analysis of these variables was carried out. After some analysis a 5 cluster solution was selected, which is shown in Table(8) . This implies that firms, if they emphasize one dimension of a competitive cluster or aspect, are also likely to emphasize the other dimensions. Following is a discussion on these five aspects of competitive mechanism.

##### 1) Product Reliability:

Five variables included in this cluster are a) providing consistent and reliable quality b) improving operating efficiency (capital, asset utilization) c) providing dependable delivery d) Providing fast delivery e)

Providing best aftersales service.

These indicate a competitive method where in consumer's dependability on the product is increased. Emphasis attached by the firm on each one of these may be different but they all essentially refer to improving consumer's reliability on the products offered. Hence we have called this cluster as product reliability strategy. This aspect of strategy as against others aspects has received very high emphasis from most of the respondents.

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Table (8) : Competitive Strategy Aspects  
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**i) PRODUCTS RELIABILITY**

- a) Provide consistent and reliable quality
- b) Improve operating efficiency (asset, capital utilization)
- c) Provide dependable delivery
- d) Provide fast delivery
- e) Provide best after sales service.

**ii) PRODUCT IMPROVEMENT**

- a) Provide high performance products
- b) Develop and refine existing products

**iii) IMAGE ORIENTATION**

- a) Create a product/market focus
- b) Advertising
- c) Build efficient business systems (dealer networks etc)
- d) Superior human resources management
- e) Provide low cost products
- f) Create a strong brand image

**iv) RESPONSIVENESS TO CUSTOMER NEEDS**

- a) Customize the products
- b) Offer breadth in product range

**v) FLEXIBILITY**

- a) Build ability to make rapid volume changes in production
  - b) Provide rapid design change in products
-

## ii) Product Improvement

This refers to a) providing high performance products and b) Developing and refining existing products.

These are dimensions of searching for better products. It arises from a belief in competitive mechanism of 'product superiority' over other competitors. It is different from the previous aspect mainly in 'performance'. Though the previous aspect emphasizes on overall reliability of the product it does not refer to looking for "better" products. The firms concentrating on high performance products usually operate in segments where price or delivery sensitivity of the customer is generally low, and product complexity is moderate to high. The product superiority as suggested by the second factor is achieved through development and refining of existing products.

## iii) Image orientation :

The components of this aspect are a) create a product/market focus b) Advertising c) Build efficient business systems (Supplier networks etc.) d) Superior human resources management e) Provide low cost products f) create a strong brand image.

The dimensions here refer to low cost, efficient business operations and strong, loyal and focused target segment. Hence advertising and creating brand image become more important. The dimensions also suggest a stable product/market segment where in "low cost to customer" is the approach and is achieved through increased efficiency in the system. The emphasis in this aspect as against the previous

two, is on matters which are not directly related to product as such. It is consistent with a strong market orientation and higher promotional expenses. Attempt here is to increase consumer loyalty to the product through a strategy of advertising, focus and low cost.

iv) Responsiveness to customer needs :

The dimensions listed in this aspect are as customizing the products and b) offering breadth in product range.

The dimensions suggest building responsiveness to customer needs. The competitive advantage is gained in matching the specific customer needs in specific ways by means of customization of products or offering breadth in the product range which suits various customer needs. Customization or semi-customization strategies are followed when there is a large difference in the needs of specific customers e.g. project selling, custom built special purpose machinery etc. require competing based on responsiveness.

v) Flexibility :

Two dimensions namely, building ability for making rapid volume changes in production and b) providing rapid design changes in products have been clustered together.

Both dimensions refer to the competitive mechanism of flexibility. The market competence is achieved by the strength in offering a fast design change ( and hence a large variety) in the products, or a rapid change in production level. The design changes should be considered in the

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context of same product (e.g. furniture).

## CONSISTENT ASPECTS OF MANUFACTURING STRATEGY :

In order to discover a parsimonious set of manufacturing strategies, the response on use of 58 manufacturing action programmes were subjected to cluster analysis. This resulted in seven clusters (Table (9)). As described previously these clusters can be taken to be aspects whose dimensions appear to be empirically consistent. Thus, they represent broad aspects of achieving a market competence through strength in manufacturing. Following is a discussion of these seven aspects of manufacturing strategy.

### 1) Controlling quality and Output :

The dimensions in this aspect suggest action programmes which affect control of quality and output. The strength built by adopting these programs is in a direction of better quality and efficiency. Statistical Quality Control, Zerodeflect programme, etc. emphasize the quality aspect where as computerization of information/control, computerization of production, inventory, reduction in manufacturing lead time, improved spares policy etc. emphasize the efficiency aspects. Just-in-time concept relates to both quality and efficiency. The programmes listed in this cluster reflect an overall plan for better 'control' on aspects of quality and output thus suggesting a competitive priority of either quality or cost.

### (2) Improvements in Human Factors :

The dimensions here suggest another managerial focal point in manufacturing, that of improving the human side of manufacturing and hence building a strength in manufacturing.

## **Table (9) : Manufacturing Strategy Aspects**

---

### **i) CONTROLLING QUALITY AND OUTPUT**

- a) Sac techniques in process
- b) Sac techniques in products
- c) Use of value analysis/product redesign
- d) Improved spares policies
- e) Zero defect programmes
- f) Computerization of information/control
- g) Introduction of Just-in-time production
- h) Computerization of production/inventory control
- i) Reduction in manufacturing lead time.

### **ii) IMPROVEMENTS IN HUMAN FACTORS**

- a) Improved employee selection procedures
- b) Improved employee training procedures
- c) Reconditioning physical plants
- d) Worker safety improvements
- e) Use of quality circles
- f) Automating jobs/manufacturing mechanization
- g) Product standardization.

### **iii) REDUCING ORGANIZATIONAL UNCERTAINTIES**

- a) Reorganization of manufacturing facilities
- b) Improved purchase management
- c) Improved quality of vendorized products
- d) Improved labour/management relationships
- e) Direct labour motivation
- f) Integration of information systems in manufacturing
- g) Developing new processes for new products

### **iv) REALIGNMENTS IN PRODUCT/PROCESS CONFIGURATION**

- a) New product introduction
- b) Increased R & D efforts
- c) Broader range of tasks to the workers
- d) Buying equipments
- e) Capacity expansion
- f) Reducing size of Workforce
- g) Develop new process for old products
- h) Improvements in preventive maintenance
- i) Energy management and efficiency
- j) Defining a manufacturing strategy
- k) Improved functioning of support groups

### **v) ROBOTIZATION AND FLEXIBLE AUTOMATION**

- a) Introducing Robots
- b) Introducing AGVS

- c) Introducing new
- d) Relocating Plants and facilities
- e) Reducing size of manufacturing unit
- f) Closing plants

## **ORGANIZING AND PLANNING OF PRODUCTION**

- a) More planning responsibility to workers
- b) Changing scheduling priority rules
- c) Inhouse production of hitherto purchased items
- d) Changing organizational structure
- e) Use of special purpose machines
- f) Use of general purpose machines
- g) Capturing marketing and distribution channels
- h) Increasing number of vendors
- i) Improvement in vendor training
- j) Improvement in vendor financing
- k) Reduction in set up time for jobs
- l) Buying technology

## **COMPUTER AIDED DESIGN, STRUCTURING AND PRODUCTION**

- a) Computer Aided Manufacturing - CAM
- b) Computer Aided Design - CAD
- c) Computer integrated manufacturing - CIM
- d) Group Technology - GT
- e) Total Quality Control - TQC
- f) Improving manufacturability of design

Improving employee selection and training, implementation of Worker safety programmes and use of quality circles (which makes workers an integral part of upgradation process) if implemented, build an overall strength in the manufacturing. Reconditioning the plants, manufacturing mechanization, product standardization are used to complement the workforce oriented programs such that a more complete manufacturing organization is involved.

### (3) Reducing Organizational Uncertainties :

The dimensions clustered together suggest an orientation towards reducing organizational uncertainties. Improvements in purchase management and improvements in quality of vendorized products are aimed at reducing uncertainties from suppliers side. Improvement in labour management relationships and direct labour motivation are used for tackling uncertainties within the organization. Reorganization of manufacturing facilities, integration among various information systems also indicate efforts in this direction. Developing new processes for new products is an attempt to reduce uncertainty faced by the manufacturing from the market forces. The firms operating in relatively uncertain environments are likely to emphasize this aspect.

### (4) Realignments in product/process configuration :

A firm's product process configuration can be explained based on a product/process life cycle matrix (Wheelwright SC, Hayes R H 1974). These firms who shift from their normal

configuration (explained in terms of type of process such as jobshop/batch production/assembly line/continuous line and product standardization such as one of a kind to mass production) due to either product proliferation or new process adoption try to re align themselves in terms of product process configuration. The dimensions listed in this aspect explain a firm's efforts for such realignment. New product introduction increased R & D efforts, buying of equipments, capacity expansion, developing new processes for old products or laying off a part of workforce suggest such realignments. Where as giving broader range of tasks to workers, improvements in preventive maintenance, energy management, or improving the functioning of support groups suggest process changes of general nature. Also associated with product or process adjustments is a distinct programme of defining of a manufacturing strategy. It appears from above that businesses going in for diversification strategy are more likely to emphasize product process realignments.

#### (5) Robotization and Flexible Automation :

Dimensions leading to Robotization & flexible automation along with those related to closing of plants, reducing size of manufacturing have been clustered together. This cluster has been made up of two very distinct aspects. The cluster lacks explainability. Some reflection on actual data showed very low emphasis attached by the most of firms on the factors listed in this cluster suggesting that Robotization, Introduction of Flexible manufacturing or

closing of plants are not regarded highly by the Indian firms.

#### 6) Organizing and Planning of Production :

Items related to reducing set up time for jobs, changing scheduling rules, vertical integration, vendorization explain the emphasis on production planning. Going for more special purpose machines, or more general purpose machines, changing organizational structure, giving more planning responsibilities to workers or buying technology suggest an underlying plan for making some structural changes in the production set up. The overall emphasis of this aspect thus seems to be on organizing and planning of production. Vertical integration and vendorization are two alternatives available at the opposite ends, similarly general purpose and special purpose machines present two extreme ends. The implications of vertical integration, technology buying, vendorization and changing organizational set up are very crucial in organizing production. Changing scheduling rules, reducing set up times for jobs, and planning responsibility to workers also has a crucial impact on production planning. It is more likely that companies having a higher emphasis on competing based on 'Product Reliability' would place higher emphasis on organizing and planning for production.

#### (7) Computer Aided Design, Structuring & Production :

Introduction of computer aided designing, computer aided manufacturing, computer integrated manufacturing, group

technology concepts, total quality control and improving manufacturability of designs have been clustered together. The developments in computer applications for production are seen as another competitive edge .

The use of these new concepts and techniques, as suggested by this cluster, can be used to derive a manufacturing strength. Though use of CIM, CAM and TQC are not common in Indian industries. They are probably perceived as next logical stage of manufacturing strength enhancement.

### DIFFERENT TYPES OF BUSINESS UNITS

After having found out the parsimonious "aspect" of business strategy it is desired to find out the strategic preferences of the business units along with these aspects. Since studying strategic preferences of individual respondent is complex, and since clusters of respondents can be easily formed without a loss of much information, clustering of the 17 business units based on dimensions of business strategy was carried out.\* Similar clustering of firms was done for competitive strategies and separately for manufacturing strategy. In each case (i.e. clustering based on business strategy, competitive strategy and manufacturing strategy dimensions) the clusters of firms was different i.e. clusters based on business strategy dimensions could not be mapped on to a cluster based on competitive or manufacturing

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\* A squared euclidian distance measure was used to form clusters using Ward's method. Predecided threshold value for rescaled cluster combine distance was used for choosing the cluster solutions.

strategy dimensions. Thus while explaining characteristic of the company clusters independent analysis had to be made in all three cases.

Nature of clusters on firms can be explained by studying their attached importance on each of the strategy aspects. In order to do this we rearranged the original data matrix (strategic dimensions by firms) to yield distinct cells, each cell containing the values of all firms within a group on all dimensions of a strategic aspect. For example values of firms belonging to one cluster on all the dimensions belonging to strengthening and rationalization aspect of business strategy form one cell. This cell is the North-West cell of ensuing table (10). To begin with, this cell contains the response of 6 business units on 5 dimensions of business strategy i.e. a 6 x 5 matrix as below:

#### BUSINESS STRATEGY DIMENSIONS

	2	2	3	2	2
	2	2	3	2	2
	2	2	3	3	2
FIRMS	3	2	3	2	3
	2	3	3	2	3
	2	2	2	3	5

The arithmetic mean of the above set is taken as representative of this cell\*. Similar means have been found for each of the cells. The 15 mean values of these cells are then ranked and then given a qualitative ordering into very -

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 \*Before analyzing the cell means each cell was also tested for homogeneity. Bartlett's Box F test within each cell confirmed the homogeneity within the cell. A Kruksal Wallace test within the cells confirmed homogeneity of population of the sample values within the cell. Use of Mann Whitney U test across all pairs of cells confirmed that values in different cells came from different population.



**Table (10) : Firm clusters and their emphasis on different business strategy aspects**

Business Strategy aspects	Strengthening & Rationalization	Diversification	Competing in present market
Firm clusters (# of firms)	Low	Moderate	High
I (6)	Very low	Moderate	High
II(6)	Low	Moderate	High
III(2)	Low	Low	High
IV(2)	Moderate	Very high	Very high
V(1)	Moderate	High	Moderate

**Table (11) : Firm clusters and their emphasis on different competitive strategy aspects**

Competitive Strategies	Product reliability	better products	image creation	Responsiveness to customer needs	Flexibility
Firm clusters (# of firms)					
I (5)	Moderate	Moderate	Moderate	Low	High
II(5)	High	High	High	High	Moderate
III(4)	Very high	High	Moderate	High	Moderate
IV(1)	Very high	High	Low	Very high	Very low
V(2)	Very high	moderate	High	Very low	Very low

low/low/moderate/high/very high as shown finally in Table(10) Similar representatives regarding competitive strategy aspects is in Table (11)and manufacturing strategy aspects in Table (12).

Nature of clusters on firms using such cells is explained for all three cases ( business strategy, competitive strategy) in the following sections.

#### Clusters of firms based on business strategy Aspects :

The attached importance by each firm cluster on all aspects of business strategy (i.e. a row vector in Table (11) explains the nature of that cluster of firms in terms of their strategic preferences.

For instance, cluster III can be represented as having a high emphasis on competing in the present market with low emphasis on strategic aspect of strengthening and rationalization or diversification, on the other hand cluster IV emphasizes on vigorous diversification added with forcefully competing in the present market areas. Its emphasis on strengthening and rationalizations seems to be limited.

#### Clusters of firms based on competitive strategy Aspects:

Table (11) shows the characteristics of firm clusters based on aspects of competitive strategy. For instance cluster I emphasizes on flexibility aspect of competitive strategy relatively higher than the other aspects. Cluster V seems to emphasize mainly on product reliability followed by image creation aspect, customer need aspects.

Table(12): Firm clusters and their emphasis on different manufacturing strategy Aspects

Manufacturing strategies	Controlling quality and output	Improvement in human factors	Reducing Organizational uncertainties	Realignment in product/ process	Robotization etc.	Organizing production	Computer Aided etc.
Firm clusters (# of firms)							
I(3)	Moderate	Moderate	High	High	Very low	Moderate	Very low
II(5)	High	Moderate	High	high	Very low	High	Very high
III(8)	Low	Moderate	Moderate	Moderate	Very low	Moderate	Moderate
IV(1)	High	Very high	Very high	Low	Very low	Very low	Moderate

## Clusters of firms based on Manufacturing strategy Aspects :

From table(12) we can study the nature of firm clusters based on their manufacturing strategy orientations. Cluster I emphasizes on reducing organizational uncertainties and realigning the process/products, where as cluster IV emphasizes heavily on improvements in human factors and reducing organizational uncertainties aspects. In cluster II emphasis seems to be on many aspects whereas in cluster III no clear pattern of emphasis can be found.

## RELATIONSHIP OF PERFORMANCE WITH THE COMPANY CLUSTERS

In order to see if any particular relationship exists between clusters explained above and organizational performance we conducted tests to ascertain the differences if any. Mann Whitney U test was conducted on all possible firm cluster combinations formed using business strategy variables and Manufacturing strategy variables. Since competitive strategies are not directly related with performance goals we did not conduct the test on clusters formed using this.

In case of business strategy, cluster II outperformed III (U statistic = 0,  $p=0.036$ ), cluster I outperformed II (U statistic = 1,  $p=0.071$ ) and cluster I outperformed V (U statistic = 0,  $p=0.036$ ). In other cases relationships could not be found. Thus we see that the companies having emphasis on competing in present market and also attaching some importance on diversification (cluster II) performed better than those just competing in the present markets (cluster III). Those following a vigorous competition and vigorous

diversification with moderate strengthening (cluster IV) performed even better than cluster II. Also those competing in present markets but also having importance on diversification and strengthening (cluster I) performed better than those having diversification as prime concern (cluster V). In other cases statistically significant results do not appear.

In case of manufacturing strategies the companies trying to reduce organizational uncertainties and realign product/process (cluster I) outperformed those going for computerization etc. (cluster II) and those depending on human factor improvements etc. (cluster IV) (U statistic values are 3 and 1 at  $p=0.091$  and  $p=0.012$  respectively). And cluster I also outperformed those having no directionalized manufacturing efforts (cluster III) (U statistic of 1 at  $p=0.71$ ). However cluster III outperformed cluster II (U statistic of at  $p=0.36$ ).

In company clusters on business strategy, we notice that the aspect of 'diversification' is associated with better performance. Similarly in company clusters on manufacturing strategy, the element of 'product/process realignment' is associated with better performance.

#### LINKAGES BETWEEN DIFFERENT STRATEGIES

We tried to study relationships between the three strategies namely manufacturing strategy, business strategy and competitive strategy. As a first step towards understanding the linkages we carried out cross correlations (Spearman correlation coefficients). Only in case of

**(13) : Manufacturing action programmes related to competitive strategy aspects**

-----

<b>Product reliability</b> -	Direct labour motivation (0.6408)* Spares Policy (.4598) Purchase Management (.6313) Integration of information (.5702) SQC (process) (.5188) SQC (Product) (.5188) Automation of jobs (.5136) CAM (.5773) Zero defect programmes (.6123) Robots (.6331) FMS (.5012) TQC (.7172)
<b>Product improvement</b> -	CAD (.4154) Reduction in set up time (.4933) Group Technology (.5019) Reorganization of manufacturing (.5020) Reduction in mfg lead time (.3911) Use of value analysis/product redesign (.5378) Improving manufacturability of design (.3370)
<b>Page orientation</b> -	Improving employee training (.5507) Reduction in mfg. lead time (.5176) New process for old products (.4613) Product standardization (.7222) New product introduction (.40) Employee selection (.6252) Quality circles (.5787) Automating jobs (.5490) New process for new products (.6654)
<b>Responsiveness to customer needs</b> -	Broader range of tasks to workers (.5855) Reduction in set up time (.36) CAD (.5890) Buying new equipments (.5543) New product introduction (.5284) Manufacturability of design (.522)
<b>Flexibility</b> -	Set up time reduction (.368) Mfg. lead time reduction (.7008) CAD (.49) Reducing size or work force (.7443) FMS (.5643) Buying technology (.5213) More R & D (.5248) Change scheduling rules (.8003)

**Pearman rank correlation coefficients at 0.001 significance**

competitive strategy vs manufacturing strategy significant and positive correlations could be found. This can be logically also followed by the fact that significant portion of manufacturing strategy decisions depend on competitive mechanism employed by the firm. For each of the 17 dimensions of competitive strategies its correlation with each of 58 dimensions of manufacturing strategy was carried out. These were then grouped along the aspects for competitive strategy. Table (13) presents these correlations. From this table we can get a set of manufacturing action programmes which are complementary to developing the said competitive aspect.

From this table we notice that there is difference in the nature of manufacturing action programmes followed which result in a competitive strength. For instance, SQC techniques, TQC, zero defect programmes, direct labour motivation etc. are used for building product reliability, whereas CAD, improving manufacturability of design etc. are used for enhancing the product improvement aspect of competitive strategy.

In the following section, study based on frequency cross tables of firms is carried out to see the dominant links or combinations between business strategy, competitive strategy and manufacturing strategy.

#### **Business strategy and competitive strategy Links**

By examining table (14), we can make the following

positions about Indian Manufacturing firms:

a) Largely indian manufacturing firms concentrate on their present markets with some emphasis on diversification. The business units of this nature adopt two distinct competitive strategies, namely

- one based on product flexibility
- one based on aspects other than flexibility, such as reliability, improvement, image etc.

This proposition is derived from the occurrence of a large number of firms in cell (I,I) and cell (I,II).

b) When the strategic orientation in a) is not supported by strengthening and rationalization business strategy aspect, then the competitive strategies tend to be more specific. These may be quite diverse i.e. one firm may be using product reliability coupled with product improvement, whereas other firm of same business strategy may be adopting product reliability coupled with product image, and yet another firm may be using product reliability coupled with responsiveness to customer needs or another firm purely flexibility.

This proposition is based on observed spread in row II.

c) Wide variety of business strategies are consistent with the competitive strategy that is based on product reliability coupled with product improvement.

This is based on the observed 'spread' in column III.



Table (14): Cross tables of firms on aspects of Business strategy and Competitive strategy

(Business Strategy Aspects)

Cluster # Nature						
V	High Diversification Mod. Present Market Mod. Strength					10
IV	V.High Diversification V.High Present Market Mod. Strength		17	16		
III	High Present Market Low Diversification Low Strength	6		5		
II	High Present Market Mod. Diversification V.Low Strength	7	4	3	2	9
I	High Present Market Mod. Diversification Low. Strengthening	12,11,15	8,13,1	14		
		I	II	III	IV	V
(Competitive Strategy Aspects)		High Flexibility	High on all Except Flexi- bility	V High Prod. Reliability High Prod- uct Improvement	High Prod. Reliability V.High Res- ponsiveness	V.High Product Reliability High Image

(The numbers indicates codes for the firms)

Table (15): Cross tables of firms on aspects of Business strategy and manufacturing strategy

(Business Strategy Aspects)

Cluster # Nature					
V	High Divers. Mod. Present Market Strength	10			
	V.High Present Market Mod. Strength	17			
III	High Divers. Low Present Market Strength	6,5			
	High Mod. V.Low Present Market Strength	3,2,14,4			
II	High Mod. V.Low Present Market Strength	7			
	High Mod. V.Low Present Market Strength	12,13,11,15			
I	High Mod. V.Low Present Market Strength	1			
	High Mod. V.Low Present Market Strength	9			

(Manufacturing Strategy Aspects)

I	High Uncertainty reduction	II	V. High Computer. High Uncertainty reduction	III	No direct-ionalized Manufacturing Strategy	IV	V. High Human factor V. High Uncertainty reduction.
	High Realignment		High Realignment				

(The numbers indicates codes for the firms )

Table (16): Cross tables of firms on aspects of competitive strategy and manufacturing strategy  
(Competitive Strategy Aspects)

Cluster # Nature					
V	V. High Product Reli. High Image	10			9
	V. High Product Reli. V. High Responsiveness				2
III	V. High Product Reli. High Product Improvement	16	5	3, 14	
II	High on all except flexibility	1	8, 17	4, 13	
I	High flexibility	7	6	12, 11, 15	
(Manufacturing Strategy Aspects)	High Uncertainty reduction	I	II	III	IV
	High Realignment	High Computer. Uncertainty reduction	No direct- ionalized Manu- facturing Strategy	V. High Human factor V. High Uncertainty reduction.	

(The numbers indicates codes for the firms)

## Business strategy and Manufacturing strategy Links

Examination of table (15), results in to the following propositions

- d) Most Indian business units have a non-directionalized manufacturing strategy and a consistent business strategy which is less vigorous.

This is derived from the observation of concentration of business units in column III.. Since business strategies of row I and II are more diffused as against business strategies of row III, IV and V, we call these two business strategies as less vigorous.

- e) Business units with more vigorous business strategies lay emphasis on manufacturing strategy that is based on computerization of manufacturing, organizational uncertainty reduction and product/process realignment.

This proposition is based on the observed frequency in column II.

## Competitive Strategy and Manufacturing Strategy Links

An examination of table (16) results in to the following propositions:

- f) Manufacturing strategy based on computerization of manufacturing (column II) is not largely based on flexibility aspect of competitive strategy.

We notice a low frequency in the cell corresponding to row I and column II.

g) Very little linkage may be present between the manufacturing strategy and competitive strategy employed.

The distribution of business units in table (16 ) is quite homogeneous without much of concentration thus suggesting that there may not be any linkages between manufacturing strategy and competitive strategy employed by a business unit.

#### NATURE OF STRATEGIC PREFERENCES IN THE SAMPLE

In this section a cross-sectional study across the entire sample is carried out in order to understand the overall strategic preferences of the entire sample

##### Strategic directions

A ranking of the 13 variables of business strategy based on the values given by the respondents was carried out. The first six significant ranks are shown in Table ( 17) below:

Table (17): Ranking on Business Strategy Variables

Rank	Variable
1	Providing product quality for surveying the competition
2	Enforcing cost control and achieving internal rationalization
3	Market penetration and improving market share
4	Providing product flexibility
5	Achieving high levels of innovation
6	Introducing new products for existing markets.

(ranking based on rank sum with 12 degrees of freedom at significance = 0.000, only the more significant ranks are shown)

This ranking suggests that the sample as a whole

prefers competition in the present market based on quality followed by cost. Preferences for market penetration and share improvement is still lower. Product flexibility is not perceived as a major strategic direction (Rank 4). The strategies related to diversification such as innovation and new product introduction are not preferred as much as competing in the present market.

From the above we can conclude that the firms in present sample attach prime importance to just competing in the present market mostly based on quality and cost. Diversification related strategies take second position in priority where as the sample does not attach any significant importance to strengthening and rationalization.

#### Competitive priorities

17 variables in competitive strategies are ranked based on the values given by all respondents. The first 10 significant ranks are shown in table (18) below:

Table (18): Ranking on Competitive Strategy Variables

Rank	Variable
1	Providing consistent and reliable quality
2	Improving operating efficiency (capital, asset utilization)
3	Superior human resources management
4	Building efficient business systems
5	Best after sales service
5	Brand image
6	Dependable delivery
7	High performance products
8	Refining existing product designs
9	Fast delivery
10	Low cost products

(ranking based on rank sum with 16 degrees of freedom at significance = 0.000)

Out of the mentioned competitive methods the sample attaches first priority to competition based on quality, followed by providing consistency and reliability in product cost. The firms believe in building superior human resources, efficient systems, brand image and after sales service. It is rather interesting to note that competing based on "Low cost" does not seem to be popular with the firms in the sample.

#### Manufacturing Programmes

Table (19) shows the first 22 ranks among the 54 action programmes specified.

-----  
Table (19): Ranking on Manufacturing Action Programmes

Rank	Action Programme
-----	
1	Improving labour management relationships
2	Energy management and efficiency improvement
3	Improving quality of vendorized product
4	Improvement in purchase management
5	Integration of information systems in manufacturing
6	Worker safety improvement
7	Reorganization of manufacturing facilities and structure
8	Direct labour motivation
9	Use of quality circles
10	Automating jobs and mechanization
11	Lead time reduction
12	Improving employee training
13	Improving preventive maintenance
14	Computerized production planning and inventory control
15	Defining a manufacturing strategy
15	Improving functioning of support group
16	Improving employee selection procedures
17	Reconditioning of physical plants
18	New product introduction
19	Product standardization
20	New process development for new products
21	Spares policy improvement
22	Increasing R&D efforts

(Ranks based on rank sum with 57 degrees of freedom at 0.0000 significance)

Examinations of the ranking suggests that the firms in this sample intend to pursue action plans relating to the Workforce, quality improvement, information and control, reduction in manufacturing lead time, reorganization and operating efficiency improvement. There is a prominent absence of the programmes related to "new technologies" in this rank list, suggesting either a lack of understanding of their implications or the barriers that exist in adoption of advanced technologies.

However we can see consistency between the adopted competitive mechanism and the action programmes to enforce that. The desire for competing on quality is reflected in action-programmes such as improving quality of vendorized products, quality circles. The need for superior human resources management is reflected in workers related programmes. The need for better business systems is reflected in improvement programmes in purchase management, reorganization, etc.



In this chapter a summary of the results and the implications derived there from are discussed.

### Strategic Aspects

We have identified certain strategic 'aspects' of business strategy, competitive strategy and manufacturing strategy.

In case of business strategy the strategic aspects identified were :

strengthening and rationalization,  
diversification and  
competing in present markets

The 'aspects' here refer to group of closely related strategic elements. For instance, the aspect of diversification comprises of elements such as new product introduction, innovation etc. Each of these aspects form an independent 'attribute' or 'direction' of the business strategy.

Similarly the aspects identified in competitive strategies were

product reliability,  
product improvement,  
image orientation,  
responsiveness to customer needs and  
flexibility

Here each of these aspects signify a different competitive mechanism that can be adopted by a firm. For example image orientation is for building customer loyalty .

product variety.

The aspects that were identified in manufacturing strategy are,

- controlling quality and output,
- improvements in human factors,
- reducing organizational uncertainties,
- realignments in product/process configuration,
- robotization and flexible automation,
- organization and planning of production and
- computer aided design structuring and production.

Now, each of these aspects of manufacturing strategy relates to different ways of building the inherent strength in manufacturing. As the aspects of manufacturing strategy are derived from confirmed action plans and not from conceptual ideas of manufacturing managers, they essentially refer to different directions of manufacturing policy of a firm.

#### **Business Strategy is Multifaceted**

Another basic question that we have addressed in this study is regarding finding 'families' or 'groups' of firms based on their strategic preferences. These preferences of a business unit are likely to be of varying interests on various aspects of business strategy. Previous literature (e.g. Peter 1980, Dess and Davis 1984) tends to take a different view. They suggested that business units are either fully defined as one class or the other. But, is it logical to 'brand' a firm based on one aspect of a strategy? We have on the other hand proposed a method of characterizing

level or values of emphasis' attached by it across all the strategic aspects. Similarly we have listed above the aspects of manufacturing strategy rather than a disparate typology of strategies. Previous literature (DeMeyer et al. 1987) has derived frameworks for manufacturing strategies which to some extent match with the manufacturing strategy aspects presented here. We can find that there is a content similarity between the aspects such as human factors, product/process realignment, etc. and the typology given in literature.

### Strategies in Indian Firms

Now coming to the business strategies of our sample firms, we noticed that largely Indian firms are concentrating on their present market areas with just a luke warm interest in diversification. Strengthening and rationalization does not seem to be popular. The firms follow a variety of competitive mechanisms, and usually specific mechanisms, such as product reliability coupled with image building. As far as manufacturing strategies are concerned, most of indian firms follow non directionalized manufacturing strategies viz. a mix of diverse aspects. A sizable portion of Indian manufacturing units also bank much on computerization of manufacturing, organizational uncertainty reduction and product/process realignments.

We can find a considerable similarity in the preferred competitive priorities of Indian Business Units and those in Europe and America (preferring quality, cost etc.). However we can notice a sharp difference if we compare with Japanese Industries (preferring flexibility, performance, cost

etc.). Preferences on manufacturing programmes in Indian firms more or less resemble European(both human factors oriented) , where as American and Japanese manufacturing programmes are new technology oriented.

#### **Relationship amongst Business Strategy, Competitive Strategy and Manufacturing Strategy**

It is also interesting to note the patterns of linkages between various strategies (business, competitive and manufacturing strategies). The firms having their concentration in present market with moderate interest in diversification and some interest in strengthening and rationalization follow diffused competitive strategies. In case of those which do not have any interest in strengthening and rationalization, the competitive strategies followed become more specific. A wide variety of business strategies are found to be consistent with the competitive strategy that is based on product reliability coupled with product improvement.

Also, firms following less vigorous business strategies tend to have non-directionalized manufacturing strategies, and firms following more vigorous business strategies tend to follow manufacturing strategy with a prominence of computerization, uncertainty reduction and product/process realignments. And linkages between competitive strategy and manufacturing strategy do not seem to exist.

#### **Effect on Performance**

As far as performance is concerned, the aspect of 'diversification' is associated with better performance, and 'product/process adjustments' are also associated with

better performance.

## The Overall Scenario

All this throws some light on the nature of indian business units. Though any generalization warrants further studies, we have however attempted a sketch of Indian manufacturing industry based on our analysis, with an intention of providing some guidelines for building a comprehensive model of indian manufacturing firms.

The manufacturing firms in India seem to be operating in stable market environments. This 'stability' characterized by less competitive makes the markets attractive so the firms tend to stick to their present market areas without being seriously interested wither in diversification strengthening or rationalization. Vigorous marketing still seems to be a forte of international firms operating in India or the Indian firms having international aspirations. Since the mass of indian manufacturing firms still follow less vigorous strategies, the firms having vigorous strategies seem to out perform the rest.

The competitive mechanisms followed are specific and definitive. 'Quality for competition' seems to be becoming an important slogan, indicating beginning of new competitive pressures.

Manufacturing does not yet take a strategic role as it ideally should. The effort there are diffused and non-directionalized. Whatever manufacturing programmes are conducted are basically for patching up some organizational inadequacies or for product/process realignments.

the obviously noticeable gap is the absence of a perspective plan for introducing the new technologies. The implications of new technologies on competence do not seem to be clear, and obviously so because of lack of tough competition. Import happens to be the most popular source of technology and equipment. Absence of directionalized manufacturing strategies also is perhaps a result of less competition hence the firms do not perceive a necessity to build a manufacturing strength in a particular direction.

|||

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# ERRATA

Please consider the following corrections in this thesis work.

Page #	Line #	Printed as	Read as
1	10	business	businesses
6	4	these	these
12	1	are	
14	2	blend	hand
21	13	depends	depend
37	6	one	are
47	12	diversity	diversary
51	7	as	a)
table 9	a,b	SoC	SQC
57	Footnote	peaks	pails
60	10	54	58
69	20	Feter	Fetter
72	11	competitive	competition
72	13	withel	either

# THE MANUFACTURING STRATEGY SURVEY 1989

## INDIAN INSTITUTE OF TECHNOLOGY, KANPUR

From:

Dr. A P Sinha  
Professor - IME  
Indian Institute of Technology  
Kanpur - 208016.

Dear Sir,

We are conducting the first national study of Manufacturing Strategies in India. Our student Mr. Ghanasham Kulkarni has designed a questionnaire which helps you self-assess the Manufacturing strategy in your Business unit/plant/division.

This survey is designed specifically to study the strategic aspects of manufacturing function. Since most of the items in this survey relate to strategic management, responses from the Chief Executive/Head of Manufacturing are solicited. Responses from a level lower than this (while by itself would be merit worthy) would serve to detract from the eventual reliability and objective of the survey. Hence I earnestly request the Chief Executive/Head of Manufacturing to help us in our work by finding time to respond to this survey.

We shall be more than happy to send you our findings relating to the strategies in Indian manufacturing industries, the strategy and performance linkages and the comparisons between manufacturing strategies of Indian industries and the Japanese, European and American industries.

We plan to begin analysis of all responses by the third week of January 1989. I shall therefore be grateful if we could have your responses in time to begin our analysis.

I assure you that all information will be treated in strict confidence and the data analysed in a manner that ensures this.

Looking forward to your cooperation , I remain

Yours sincerely,

( A P Sinha )

## THE MANUFACTURING STRATEGY SURVEY-89

Please return to -

Dr. A P Sinha/Mr. Ghanasham Kulkarni.

IME

1 I T Kanpur 208 016

## SECTION 1

In this section the questions are aimed at your own evaluation of your business unit's **manufacturing strategy**. We visualize 13 major decisions in your manufacturing strategy. Hence the following 13 items of this questionnaire are meant to help you chart manufacturing strategy of your business. Most of these questions would require either qualitative or semi-quantitative answers. In the case of quantitative answers, if data is not available, then your own estimates for these will serve the purpose. In answering about the future please consider a period of about **two years** from now as a horizon. Mark the options (wherever applicable) with a tick, and in case of ambiguity, kindly clarify.

### PROJECTED EXPANSION OF THE BUSINESS UNIT

ording to present approved plans for this business unit, in what area  
you propose to expand in the near future ( say two years)

likely source of technology for above expansion

- New long term foreign collaboration
- Use of existing foreign collaboration of existing business
- One time purchase of foreign know how
- Purchase of Indian know how
- No need for additional know how
- In house development of technology

likely source of equipment

- Foreign turnkey contract
- Largely foreign equipments
- Some foreign and some Indian equipment
- Mostly Indian equipment
- In house building of equipment

ected investment in expansion (for next few years): Rs \_\_\_\_\_  
planned Horizon( years ): \_\_\_\_\_

Planned Horizon( years ): \_\_\_\_\_

Planned Horizon: years 7

Compared to the existing size of your enterprise would you consider the  
the expansion a

for one                  medium sized                  minor one

mode of expansion planned is (tick)

- a) new capacity creation, or
- b) acquisition

ng of expansion will be (tick)

- a) to build full capacity well in advance of the actual demand, or
- b) build in small increments of capacity

## 2 PROPOSED PLANTS

Do you intend to build/buy new plants in the near future (say the next two years) ?

yes

no

If yes -

Your preference is for

- a) Multiple locations , or b) Single location

Each plant will be designed to produce the products

of one kind      of a small variety      of large variety

The plants will be situated in

- a) Backward areas      b) Industrial concentrations  
c) Upcoming industrial towns

## 3 VERTICAL INTEGRATION

For your major products, please mention the % of the value added within the company to the final product value.

0% 10 20 30 40 50 60 70 80 90 100 %

If the plant is trying to change this figure in near future (two years) please indicate the expected new figure below

0% 10 20 30 40 50 60 70 80 90 100 %

Excluding Sales Tax, what % of the final consumer price is given to the outside trade channels

0% 10 20 30 40 50 60 70 80 90 100 %

If the plant is trying to change this figure in near future (two years) please indicate the expected new figure below

0% 10 20 30 40 50 60 70 80 90 100 %

## 4 EQUIPMENT AND PROCESS TECHNOLOGY

Nature of equipments :

- a) Mostly general purpose      b) A mix of general & special purpose  
c) Mostly special purpose

Importance of the manufacturing automation to the business unit,

critical      high      moderate      somewhat      low

Adopted at least some form of automation in the last four years

yes

no

Investment in automated manufacturing process relative to other capital expenditure in last four years is

extremely high      high      comparable      low      negligible

Extent of automation in the manufacturing process

- a) A few machines are automated  
b) A few production lines are automated  
c) Almost entire process is automated.

Types of jobs automated

Material handling

Assembly

Process control

b) Fabrication

e) Clerical

h) Other (please specify) \_\_\_\_\_

c) Inspection

f) Machining

## VENDORS

Structure of vendorisation

a) Large vendors with small sub vendors supplying to them

b) Large vendors only

c) Small vendors only

Average vendor's reliability for supply on time

excellent      good      fair      unsatisfactory      poor

Average vendor's product quality

excellent      good      fair      unsatisfactory      poor

Satisfaction regarding vendor development programmes

excellent      good      fair      unsatisfactory      poor

The method(s) followed for improving the quality of vendorised products (tick one or more)

a) Tightening acceptance specifications

b) Stressing importance of quality

c) Working with vendor(s) on process control

d) Working jointly on process and product development

e) Utilizing competition between vendors

Your emphasis on having many vendors for supplying one item

very high      high      moderate      low      nil

## 6 NEW PRODUCT DEVELOPMENT

Frequency of new product introduction

highest frequency of new product introduction in the industry	frequency of new product introduction more than many others in the industry	frequency of new product introduction is on par with others in the industry	occasional introduction of new product	maximum preference for remaining with established product
---	---	---	--	---

Product variety (range of products)

widest in the industry	wider than many others in the industry	comparable with others in the industry	narrower than others in the industry	narrowest in the industry
------------------------	--	--	--------------------------------------	---------------------------

Number of new Product features introduced per year

largest in the industry	larger than many others in the industry	comparable with others in the industry	smaller than others in the industry	smallest in the industry
-------------------------	---	--	-------------------------------------	--------------------------



Product innovation (i.e. R & D) efforts

most aggressive in the industry	more forceful than many others	comparable with others in the industry	less aggressive than others in the industry	least in the industry
---------------------------------	--------------------------------	--	---	-----------------------

## 7 WORK FORCE

Method(s) for work force motivation

- |  |                               |
|--|-------------------------------|
| a) Improvements in physical conditions | b) Financial incentives       |
| c) Fringe benefits                     | d) Job security               |
| e) Inter personal relationships        | f) Any other (please specify) |

Majority of the workers are    a) Skilled    b) Semi-skilled    c) Unskilled

## 8 QUALITY

At your plant what is the total cost of maintaining quality i.e. cost of defect prevention, detection, and overall quality management as a % of the manufacturing cost \_\_\_\_\_ % (approx.)

How satisfactory are the following functions of quality at your plant ?

Defect prevention	excellent	good	fair	unsatisfactory	poor
Quality monitoring	excellent	good	fair	unsatisfactory	poor
Clear definition of quality at every stage	excellent	good	fair	unsatisfactory	poor
Level of commitment of your managers to the role of quality	excellent	good	fair	unsatisfactory	poor
Level of commitment of your workers to the role of quality	excellent	good	fair	unsatisfactory	poor

## 9 PRODUCTION PLANNING PRIORITIES

For normal production planning and scheduling purpose and for scheduling around the end of period ,what priorities for jobs are used in your plant ? (please tick the two most used rules of the following)

	Normal Scheduling	End of Period Scheduling
Complete the highest sales value job first	___	___
Satisfy the most important customer first	___	___
Take up jobs that can use same machine set up -and use capacity more effectively	___	___
Take up work on all available jobs and satisfy -most customers	___	___
Take up jobs in the order of due dates	___	___
Give priorities to the jobs which can be -finished faster	___	___
Any other (please specify) _____	___	___

## 10 COMPUTERIZED INFORMATION SYSTEMS

Please tick those of the following which are computerized in your plant.

- |                                    |  |
|------------------------------------|--|
| 1) Sales forecasting               | 2) Inventory status reporting (raw mtrls)  |
| 3) Work in process reporting       | 4) Master production schedule              |
| 5) Materials requirement planning  | 6) Process planning                        |
| 7) Shop floor control of machining | 8) Process control                         |
| 9) Design engg. (including CAD)    | 10) Computer Integrated Manufacturing CIMS |
| 11) Quality monitoring             | 12) Quality reporting                      |
| 13) Cost accounting                | 14) Order processing                       |
| 15) Purchase management            | 16) Others (please specify) _____          |

### Integration of computer systems

Please indicate the presence of integration amongst your computer systems or any immediate plans to have these in your firm by means of a tick in the appropriate row/column. For example if master production schedule is integrated with materials requirement planning MRP, please put a tick in the intersection of row 5 & column 4. (refer to previous question for complete names for the various abbreviations listed below).

1	Sales forecasting																
2	Inventory status																
3	Work in process																
4	Master prodn.sched																
5	MRP																
6	Process planning																
7	Shop floor control																
8	Process control																
9	Design engg.																
10	CIMS																
11	Quality monitoring																
12	Quality reporting																
13	Cost accounting																
14	Order processing																
15	Purchase mgmt.																
16	Others																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

## 11 ORGANIZATION

In case of the decision making within the plant please rate below the extent to which the decisions rely on specialized technically trained personnel or on personnel largely with administrative experience.

reliance mostly on specialized technically trained personnel	more reliance on specialized technl personnel	equal reliance on both kind of personnel	more reliance on personnel with experience	reliance mostly on experien -ced perso -nnel
--	---	---	--	--

Percent of professionals such as graduate engineers, CAs, and MBAs in your business unit \_\_\_\_\_ %



### 13 ENVIRONMENTAL UNCERTAINTY

Please indicate on the scale provided, the uncertainty faced by you in each of the following six elements of the environment

	highly uncertain	largely uncertain	vaguely predicta- -ble	largely predicta- -ble	highly predicta- -ble
1 Actual users of products	[ ]	[ ]	[ ]	[ ]	[ ]
2 Vendors	[ ]	[ ]	[ ]	[ ]	[ ]
3 Competitors	[ ]	[ ]	[ ]	[ ]	[ ]
4 Government regulations	[ ]	[ ]	[ ]	[ ]	[ ]
5 Public attitude	[ ]	[ ]	[ ]	[ ]	[ ]
6 Trade unions	[ ]	[ ]	[ ]	[ ]	[ ]

### SECTION 2

This section on Business Strategy aims at your own evaluation of your firm's Business Strategy. The items included in this section describe the strategic direction taken by your business. The emphasis you place on each of the following determines the profile of your business strategy. Please show your **degree of emphasis** (very high emphasis to very low emphasis) you attach on each of the following by marking on the scales provided

VH - VERY HIGH H - HIGH M - MODERATE L - LOW VL - VERY LOW

	VH	H	M	L	VL
1 Providing product flexibility( product variety ) and thus maneuvering for position in the market.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Establishing product quality for surviving against the competition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Market penetration and improving market share	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Enforcing cost reduction and controls in the company in order to achieve the internal rationalization and hence controlling the product cost .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Making maximum profits out of your present market position and least interest in market share building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Withdrawal from certain markets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Achieving high levels of innovation in the products or processes and thus gaining an upper hand over the competitors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Introducing new products for the existing markets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9 Introducing new products for the new markets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

VH - VERY HIGH H - HIGH M - MODERATE L - LOW VL - VERY LOW

	VH	H	M	L	VL
10 Entering the new markets with the already existing products.					
11 Growth by acquisition of business units.					
12 Forward Integration e.g. capturing or building the marketing and distribution channels which are held by outside agencies.					
13 Backward integration e.g. making the components/sub-assemblies required in the manufacturing which are presently being bought out from the vendors.					

### SECTION 3

Following section deals with competitive priorities. Your firm obviously tries to achieve a competitive advantage in the market by adopting various competitive methods. It is this competitive edge that makes all the difference among the competitors. This is the central issue in business strategy and the product/market decisions. Given below is a set of seventeen competitive priorities. Some of them may be interconnected. You are requested to please indicate on the scales provided, the **significance** of the following competitive priorities for your firm's performance.

C- CRITICAL SG- SIGNIFICANT M- MODERATE SM- SMALL N- NO

	C	SG	M	SM	N
1 Providing consistent and Reliable quality to the customer					
2 Develop high performance products( new product development)					
3 Provide highly reliable/dependable delivery					
4 Providing low cost products					
5 Provide fast delivery					
6 Provide rapid design change in the products					
7 Provide the best after sales service					
8 Ability to make rapid volume changes in production					
9 Customizing the products					
10 Offer breadth in the product range					
11 Improving operating efficiency (capital or asset utilization)					
12 Developing and refining on the existing products					
13 Building a strong brand image					

C- CRITICAL SG- SIGNIFICANT M- MODERATE SM- SMALL N- NO

	C	SG	M	SM	N
14 Creating a product or market focus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15 Advertising	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16 Building efficient business systems (dealer networks, supplier network etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17 Superior human resources management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### SECTION 4

This section contains questions on the specific action programmes for manufacturing that the business unit has under way presently or has specific plans to launch in the following two years. Kindly mention, on the scale, the extent to which you are working on or have firm plans to work on the following action programmes.

VH - VERY HIGH EMPHASIS    H - HIGH EMPHASIS    M - MODERATE EMPHASIS    L - LOW EMPHASIS    VL - NO EMPHASIS

	VH	H	M	L	N
1 Giving a broader range of tasks to the workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Giving more planning responsibility to workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Improving labour/management relationships	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Direct labour motivation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Reorganization of Manufacturing facilities and structure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Worker safety improvement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Improving employee selection procedures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Improving employee training procedures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9 Use of quality circles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10 Automating jobs and manufacturing mechanization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11 Improvements in preventive maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12 Improvements in spares policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13 Zero-Defect programmes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14 Use of computerized production and inventory control systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15 Programmes for reduction of manufacturing lead time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16 Improvements in purchasing management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17 Improvement in the quality of the vendorised products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

... Level of emphasis on action programmes underway or planned ...contd.

VH - VERY HIGH EMPHASIS	H - HIGH EMPHASIS	M - MODERATE EMPHASIS	L - LOW EMPHASIS	VL - NO EMPHASIS	
					VH H M L N
18 Computer Aided Manufacturing - CAM					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
19 Computer aided Designing - CAD					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
20 Reduction in set up time for the jobs					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
21 Use of value analysis or product re design					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
22 Use of Group Technology (grouping of jobs and machines for more efficient working					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
23 Reducing the size of workforce					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
24 Capacity expansion					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
25 Reducing size of the manufacturing units					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
26 Developing new processes for the old products					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
27 Developing new processes for the new products					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
28 Product standardization					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
29 Integrating the various information systems set up for manufacturing					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
30 Computerization of information and control systems in manufacturing					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
31 Reconditioning physical plants					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
32 Plant relocation					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
33 Introducing robots					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
34 Introduction of Flexible Manufacturing Systems (FMS)					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
35 Introduction of Automated Guided Vehicle Systems (AGVS)					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
36 Closing Plants					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
37 Statistical Quality Control(SQC) techniques in process					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
38 Statistical Quality Control(SQC) techniques in products					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
39 Defining a manufacturing strategy					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
40 Energy management and efficiency programmes					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
41 Introduction of Just-In-Time (JIT) production					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
42 Introduction of Computer Integrated Manufacturing (CIM)					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
43 New product introduction					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

... Level of emphasis on **action programmes** underway or planned ...contd.

**VH** - VERY HIGH EMPHASIS    **H** - HIGH EMPHASIS    **M** - MODERATE EMPHASIS    **L** - LOW EMPHASIS    **VL** - NO EMPHASIS

	<b>VH</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>N</b>
44 Improving manufacturability of design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45 Total Quality Control TQC/Taguchi methods introduction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46 Buying technology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47 Increasing R & D efforts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48 Use of more special purpose machines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49 Use of more general purpose machines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50 Capturing the marketing/distribution channels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51 In house production of hitherto purchased items	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52 Altering the scheduling priority rules	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53 Changing organizational structure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54 Improving the functioning of support groups (e.g. systems dept.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55 Improving the vendor financing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56 Improving the vendor training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57 Increasing the number of vendors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58 Buying equipments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## SECTION 5

This section concerns about your evaluation of the business performance. Performance is measured here on a set of ten criteria. Please rate along these, the **actual performances of the business as against your a priori expectations** of these.

**E** - EXCELLENT    **G** - GOOD    **F** - FAIR    **U** - UNSATISFACTORY    **P** - POOR

	<b>E</b>	<b>G</b>	<b>F</b>	<b>U</b>	<b>P</b>
1 Sales growth rate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Market share	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Cash flow from operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Operating profits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Net profits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Return on investment (ROI)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



E - EXCELLENT G -- GOOD F - FAIR U - UNSATISFACTORY P - POOR

	E	G	F	U	P
7 New product development					
8 R & D activities					
9 Cost reduction programs					
10 Human resources development					

Also please indicate the relative importance or relevance of such performance measures in the context of your business unit on the linear scales provided

	critical	signi- ficant	fair	insigni- ficant	nil
Sales growth rate	[ ]	[ ]	[ ]	[ ]	[ ]
Market share	[ ]	[ ]	[ ]	[ ]	[ ]
Cash flow from operations	[ ]	[ ]	[ ]	[ ]	[ ]
Operating profits	[ ]	[ ]	[ ]	[ ]	[ ]
Net profits	[ ]	[ ]	[ ]	[ ]	[ ]
Return on investments	[ ]	[ ]	[ ]	[ ]	[ ]
New product development	[ ]	[ ]	[ ]	[ ]	[ ]
R & D activities	[ ]	[ ]	[ ]	[ ]	[ ]
Cost reduction programmes	[ ]	[ ]	[ ]	[ ]	[ ]
Personnel development	[ ]	[ ]	[ ]	[ ]	[ ]

#### GENERAL INFORMATION ABOUT THE COMPANY

Name of the company :

Nature of company :

Private co.	Public co.	Government co.
co. deemed to be Public	Holding co.	Subsidiary co.
one man or a family co.	Foreign co.	Partnership firm
"Business House" of _____		

Year of establishment of the company : \_\_\_\_\_

Number of manufacturing units : \_\_\_\_\_

Any technological collaborations YES NO

If yes ,

Name of the collaborator(s) :

Year of collaboration(s) :

#### GENERAL INFORMATION ABOUT THE BUSINESS UNIT

Name of this Business unit/division/plant:

Total number of employees : \_\_\_\_\_

Managerial : \_\_\_\_\_

Staff : \_\_\_\_\_

Others : \_\_\_\_\_

Manufacturing work force

Direct : \_\_\_\_\_

Indirect : \_\_\_\_\_

Please mention (for the products produced in this business unit) the following : (pl. attach additional sheets if necessary)

sl. No.	product	production volume (last year)	Expected production volume in the coming year
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Please indicate the following six financial indicators of your business unit (for last five years).

The closing month \_\_\_\_\_  
1984    1985    1986    1987    1988

- 1) Sales
- 2) Gross profits as a % of net sales
- 3) After tax profit as % of net worth
- 4) R & D as % of sales
- 5) % growth in net sales
- 6) % growth in net profits

#### COST STRUCTURE OF THE BUSINESS UNIT

1 Please mention your Manufacturing costs as % of your Total costs : \_\_\_\_%

2 Please mention the following costs as % of your manufacturing costs :

Raw material, semi-finished, components : \_\_\_\_%

Direct labour : \_\_\_\_%

Fuel and energy : \_\_\_\_%

Manufacturing overheads : \_\_\_\_%

Name of the Respondent: \_\_\_\_\_

Designation of the respondent : \_\_\_\_\_

Office address: \_\_\_\_\_